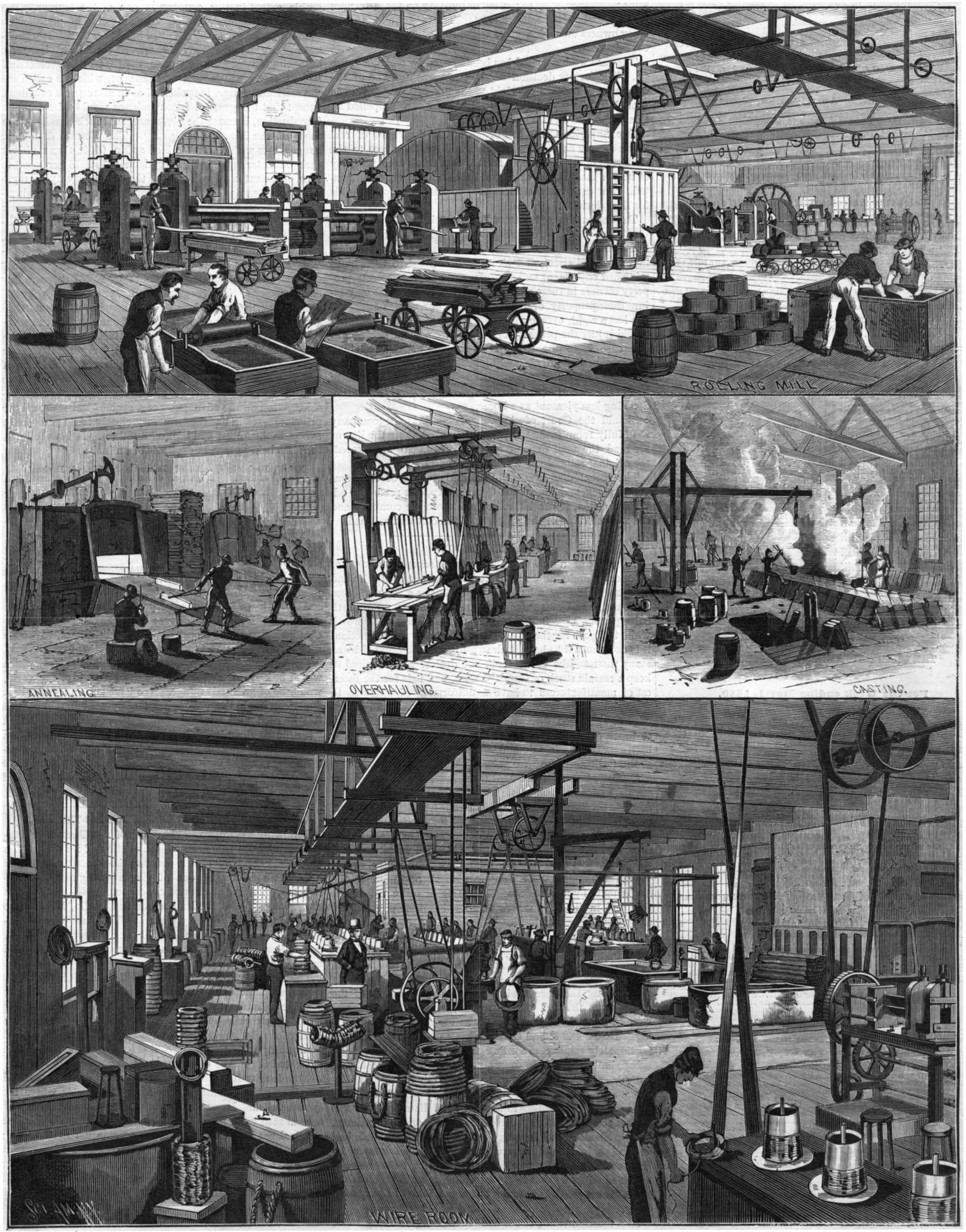
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLII.—No. 18. [NEW SERIES.] NEW YORK, MAY 1, 1880. [$3.20 per Annum. [POSTAGE PREPAID.]



BRASS MANUFACTURE.—BENEDICT & BURNHAM MANUFACTURING COMPANY, WATERBURY CONN.—[See page 277.]

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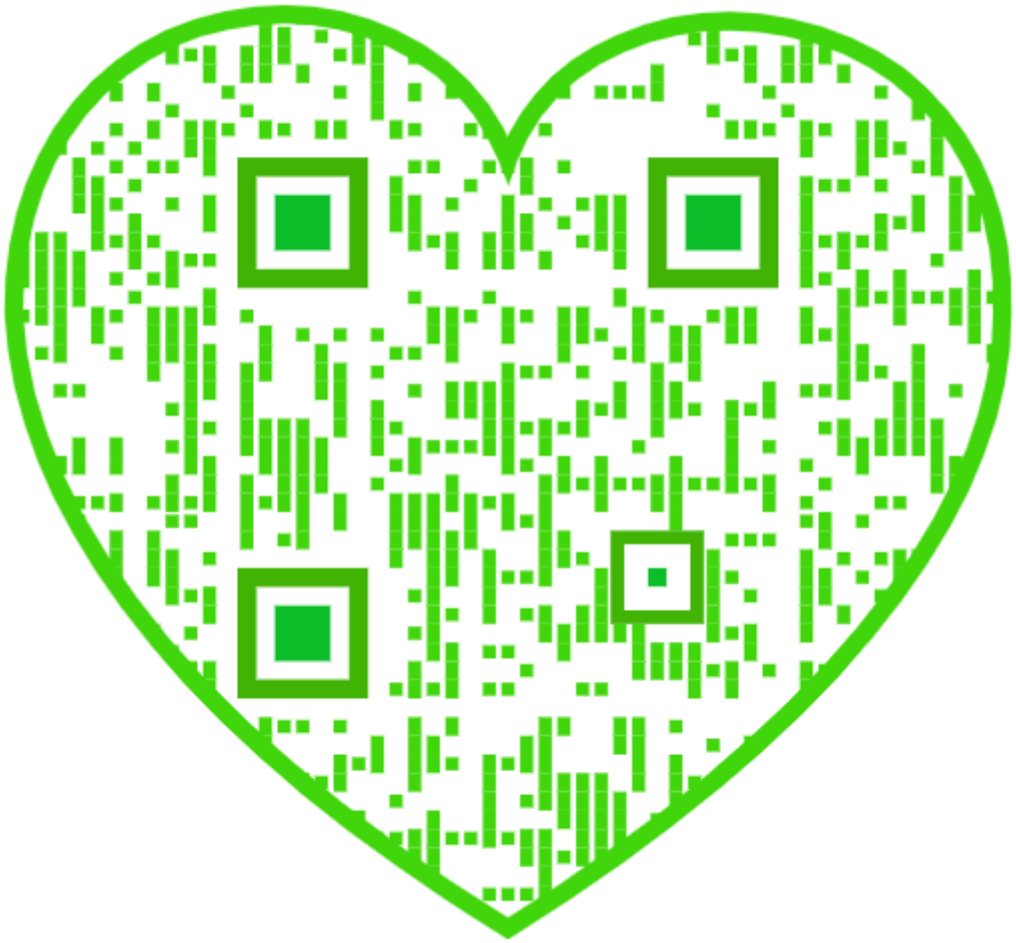

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, MAY 1, 1880.

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ELEVATED CITY RAILROADS.

The decision of the Superior Court against the Metropolitan Elevated Railroad Company, in the recent trial case, attaches a new interest to the subject of rapid city transit. This suit was brought by Dr. Caro, the owner of a house on Fifty-third street, to recover damages sustained by the passage of the elevated road in front of his dwelling.

This street is hardly surpassed for fine residences and beauty by any in the city. The effect of the elevated road has been to reduce the market and rental value of property on its line. When the road was first constructed the best houses were rapidly emptied of their occupants, and even at a great reduction in rent were difficult to fill with tenants. The people along the line of the railway have now become more accustomed to the railway nuisance, yet nearly the same reluctance holds to renting or locating on those avenues or streets where the railway exists. The injury done to property owners on such a street as the Fifty-third is no trifling consideration.

The case we have cited has been argued by eminent counsel. The former decision of the court was in favor of the company; it claimed the right to the use of the street, even though by a new and unusual way, as by cars propelled by steam upon an elevated road.

The Superior Court has decided that the rights of real estate owners extend beyond the limits of the street to the exclusion of whatever may tend to depreciate their property or render their homes unpleasant, unless properly remunerated. The case will doubtless pass to the Court of Appeals for final decision.

The concurring opinions of Judge Speir and Chief-Justice Curtis are elaborate, covering the grounds claimed by plaintiff. They set forth that plaintiff is owner of the premises in Fifty-third street, and as such is entitled to their undiminished enjoyment and advantage. The law protects property owners in these rights against everything that may injure their property or render their homes unpleasant. No one has a right, even on his own premises, to do aught that would injure the property of his neighbor. The decision in this case is to the effect that noxious gases, disturbing noises, shutting out air and light, are, in point of law, real invasions of the owners' premises. They depreciate greatly the market and rental value of the property, and render the dwelling less pleasant as a home.

Should the Court of Appeals decide that the company shall fully remunerate the property holders along the line of the road, the final expense must fully equal, if not exceed, the original estimate of the underground line.

The recent decision has affected the price of the company's stock, and should the Court of Appeals render an adverse decision, it can but affect still more the company and the market value of the property of the elevated railroad.

THE WIRE GAUGE.

The want of a uniform and generally accepted system of numbering and grading the different thicknesses of wire and sheet metal has for a long time been felt as a serious inconvenience, both by manufacturers and consumers. For particular purposes, or in filling large orders, where it is worth while to figure for the size of wire to a very small fraction, it is not unusual to have it drawn to a size designated by so many thousandths of an inch, but dealers are required to keep a certain stock of standard sizes, and it is for the interest of manufacturers to have a uniformity of usage as to what shall be meant when a certain size of wire or thickness of plate are called for. We have not, in this country, had so much confusion, from the use of different gauges, as has been experienced in England, where, under what is known as the "Birmingham wire gauge," more than a dozen different scales of numbers are used to arbitrarily designate different sizes of wire, from those about half an inch in diameter down to the finest wires drawn. There is a pretty close agreement between several of these gauges for most of the numbers, but no one is acknowledged as a standard, and, unless the actual size as well as the number is given when ordering wire, mistakes and misunderstandings frequently occur. What the manufacturer may furnish as one number the dealer may, by using another scale, sell as quite a different size, and, in times of active competition, the opportunities to do this are frequent.

The present system of designating the sizes of wire by numbers has grown up with and been modified according to the development of the manufacture. What is known as No. 1 is supposed to have been originally so designated as representing the wire made from the first passing of the rough metal through the draw plate, with such facilities as were in use before steam power was employed in wire making. Nos. 2 and 3, and the following sizes, were each proportionately smaller, according to the results obtained by using similar means in drawing the wire down, the higher numbers representing constantly diminishing sizes. To designate thicknesses larger than No. 1, one or more ciphers are now used, according to the increased diameter. By this system the different sizes varied from each other irregularly, both in diameter and in weight of metal, but the trade had become so large, and the common sizes so well known by their numbers among mechanics and dealers, before any determined effort was made to introduce a uniform standard scale, that the task is now one of more than ordinary difficulty.

At a recent meeting of the Society of Telegraph Engineers, London, England, the differences between well-known wire gauges was made the subject of an elaborate report by a committee which had been appointed especially for that purpose. It was shown that there was an urgent necessity for some standard, and that the gauge, to be adopted should not vary materially from the present gauges principally used, which were "based on long practical experience, had become thoroughly rooted in technical language, and were well adapted to the practical requirements of trade." All of the principal gauges were referred to, and tables given showing the sizes, with percentage of reduction in weight and differences in size for the various numbers. Two general classes were made: empirical gauges or those in which the gradations between the respective sizes were formed by arbitrary differences; and geometrical gauges, in which the various sizes were fixed by perfectly uniform decrements of weight from size to size. The "Stubs" gauge, which is used to a considerable extent in this country, is one of the former. The committee say that, though very irregular in many of its gradations, it has been distributed in large quantities throughout the world, and "may perhaps be considered the most authoritative gauge in common use." Of the geometrical gauges, that made by Brown & Sharpe, which is called the "American" gauge, is spoken of as in all respects excellent, except that the greatest inconvenience would arise from its introduction, because the sizes are so much smaller than those of the Birmingham gauge. The Brown & Sharpe gauge starts with 0·46 of an inch as No. 0000; then multiply each diameter by 0·890522 (or deduct 10·9478 per cent) to form the next succeeding size, the numbers varying regularly in size and weight, and, of course, in electrical conductivity. As being preferable to this gauge, however, because the sizes more nearly approach those of the ordinary Birmingham scale, the committee recommend the Clark gauge, in which the intervals are so arranged that each size is exactly 20 per cent less in weight than the preceding one. By this scale the diameter diminishes by 10·557 per cent for each number as the sizes grow smaller, or increases by 11·803 per cent as they are enlarged; and, as with all geometrical gauges, a person knowing the size of one number can readily calculate that of any other. A sufficient number of intermediate sizes to fill all requirements for general use can be made by using half and quarter sizes, the thickness of which can be determined with precision. The committee strongly recommend this gauge for general adoption, as, beside, giving all the advantages of a geometrical scale, all the principal sizes in use conform very closely to its gradations, except in the lowest and highest numbers. It is as follows, the sizes being given in decimals of an inch:

No. of gauge.	Decimals of inch.	No. of gauge.	Decimals of inch.	No. of gauge.	Decimals of inch.
000	492·1	10	129	22	033·8
00	440·2	11	115·4	23	030·2
0	393·7	12	108·2	24	027·1
1	352·1	13	092·3	25	024·2
2	315	14	082·6	26	021·6
3	281·7	15	073 9	27	019·4
4	252	16	066·1	28	017·3
5	225·4	17	059·1	29	015·5
6	201·6	18	052·8	30	013·9
7	180·3	19	047·3	31	012·4
8	161·3	20	042·3	32	011·1
9	144·2	21	037·8		

Although we have not experienced the trouble from the use of a multiplicity of gauges which has been felt by foreign manufacturers, there can be no doubt that, if we are ever to have any export trade in manufactures of metal goods, the general adoption of some geometrical standard, which would be known and acknowledged in all parts of the world, would be of great advantage. We have such a standard for American use in the gauge now largely used here, but with this is used also the "Stubs" gauge, and what is called "the old English;" and, between them all, mechanics and engineers are constantly giving orders for specific sizes, measuring by the thousandth part of an inch, as they would not feel called upon to do if there was a recognized standard of properly graded sizes.

THE FRACTURE OF THE DUILIO'S 100-TON GUN.

Following hard upon the bursting of the Thunderer's 38-ton gun and the experimental destruction of its companion to discover the secret of that disaster, there comes a still more remarkable failure of one of the largest guns ever constructed. During a series of experiments with the 100-ton Armstrong guns of the Italian ironclad Duilio, March 6, to test, not the guns, for they were considered as beyond suspicion, but the smooth working of the accessory machinery, one of the guns gave way in a manner altogether novel and unexpected.

The Armstrong guns, as our readers are all doubtless aware, are built up by the shrinking of a dozen or more massive coils of wrought iron upon a steel tube forming the bore. These coils overlap, and are designed to resist the circumferential strain of the exploding charge. The need of anything more than the friction of the coils upon each other and the tensile strength of the inner steel tube, to resist the longitudinal strain, does not seem to have entered into the maker's calculations. And just here is where the system failed. It was found after the disaster, in which several men were more or less seriously injured, that the gun had not burst, in the ordinary acceptation of the term; the interior steel tube had been entirely fractured across at the point where the enlarged powder chamber begins to slope toward the lesser part of the bore—the shoulder of the powder chamber, as it may be called. The rest of the gun, composed of various tubes made of coiled wrought iron, had simply disengaged itself as a glass stopper might be drawn out of a bottle, and the tubes were not broken in the slightest degree. Each one appeared to be as sound as

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when it had been shrunk on to its fellows. The whole of the muzzle, together with the trunnions and the coils immediately behind the trunnions, even including the inner one which surrounds the steel tube, remained fixed by the trunnions to the carriage. The only movement of this mass had been the depression of the muzzle. The rest of the gun, including the whole of the breech, containing the rear part of the steel tube, from the shoulder of the powder chamber backwards, had separated itself from the muzzle portion, and, being unsupported, had yielded to the force of the discharged powder and been dashed backwards against the wall of the turret, displacing two of the plates, cracking the steel lining like a mirror, and crushing the heavy wooden backing through the gap made between the two plates.

The gun had been loaded by hand with a battering charge of 550 pounds of Fossano powder and a 2,000 pound projectile. It is claimed in favor of the gun that it was not originally designed to be chambered, nor to fire charges of 550 lb. with a velocity of 1,700 feet. The contract was fulfilled when 440 lb. of English pebble powder gave an initial velocity of 1,585 feet, with a total energy to shot of 34,840 tons, which gives 627 foot tons per inch of circumference, with a pressure upon the interior of the gun not exceeding 17 tons per square inch. The charge which created the destructive effect almost entirely filled the chamber and left practically no air space. Besides it developed a total energy of 40,000 foot tons, an energy of 720 foot tons per inch of circumference, and an interior strain of 20 tons per square inch. This the gun proved unable to withstand. The friends of the gun claim that its failure under these conditions argues no inherent defect in the system, and that there will be no difficulty in adding to the longitudinal strength of the guns to any extent that may be desired. Nevertheless public confidence in the system has been seriously broken, and the indications are that this most popular British mode of building great guns will have to be entirely reconsidered.

A REMARKABLE OIL COMPANY.

In many respects the Columbia Oil Company of Pittsburg is unique, and its career a remarkable one. The common lot of oil (petroleum) companies is to "bust," to involve stockholders in ruin, and to go into dividendless oblivion. To these rules the Columbia is a marked exception. For nearly twenty years it has produced petroleum, and today its territory adds over 400 barrels to the daily yield of the oil regions. Since the organization of the company in 1861 its properties have produced 2,748,820 barrels of crude petroleum, of 42 gallons each. During the same period the price of oil has ranged from $13 per barrel in July, 1864, to 65 cents per barrel in June, 1879. During its existence the company has declared and paid dividends to the amount of nearly four million dollars ($3,980,100), and the selling price of its stock (par $50) has ranged from $105 per share all the way down to $4·75 per share. The original shares numbered 10,000, but in 1864 were "watered" to 50,000 shares, making wealthy men of the "ground floor" stockholders. The oil-producing territory of the company comprises a number of farms in Venango, Butler, and McKean counties, Pennsylvania, but by far the most productive tract is the "Story Farm," located on Oil Creek, six miles from Oil City, Pa. In fact it is very doubtful whether a tract of the same area in the known world has been compelled artificially to yield so enormous a quantity of oil. The Story Farm comprises 600 acres, but the oil-producing portion of the tract is less than 100 acres. From this tract has been produced, up to April 1, 1880, 2,226,995 barrels of petroleum, and at present there is still 60 barrels per day coaxed out of this farm. This is done in a thoroughly systematic way, a single engine by means of "sucker rod" connections, pumping seven wells at once, thus reducing the outlay for wages to a minimum. A singular well was developed upon this farm some years ago, and its irreverent activity fully earned its title of the "Sunday Well." For months this well would flow only upon the first day of the week, refusing to respond to any known processes for inducing it to produce on week days. The headquarters of this veteran oil company are at Pittsburg, but the stock is held in New York, Philadelphia, and St. Louis. The last dividend was declared April 10, 1878, the low price of oil compelling this action.

THE GREAT GAS WELL OF PENNSYLVANIA.

Since the appearance of the article in these columns regarding the great gas well at Murraysville, Pa., and the carbon black works in process of construction, the owners of the well have been overwhelmed with letters from all portions of the country. These were mainly letters of inquiry from parties possessing similar wells, and indicate a widespread interest in the matter of the utilization of the vast storehouses of fuel tapped by the drill in various portions of the country. Recent tests of the Murraysville stream of gas indicated a pressure of 150 lb. per square inch as shown by a steam gauge. The test was necessarily imperfect and brief, inasmuch as the pipes showed signs of bursting. Owing to unforeseen delays, the carbon black works have only just commenced operations.

A Bewitched Telegraph Wire.

Mr. Siemens states that when he was engaged on the line of the Indo-European Company between Djulfa and Tabreez he found it necessary to intimidate the natives, who rather fancied the wire for various purposes. He was able to do this in a very effectual manner, for having found that at that time of the year there was a thunder storm nearly every afternoon, during which the line, being insulated, was charged by induction, he brought about a gathering of the natives and persuaded one of their notables to ascend a ladder and touch the wire, saying the wire would defend itself. On doing so, the man received such a shock that he fell down the ladder, and the wire was considered after that by the natives as being bewitched.

AMENDING THE PATENT LAW.

The raid upon our whole patent system, as it can only be properly characterized, which the proposed new law, referred to in our issue of March 6, promised to effect, seems now to be virtually defeated. There is no absolute safety against hasty and ill-considered legislation, it is true, so long as the matter remains in its present shape, but an effectual check has been put upon the operations of the would-be raiders. The exhaustive arguments presented to the Senate Patent Committee relative to the bill, with the amendments proposed by the members of the committee themselves, utterly destroy its force for the special end which was said to be the object of its promoters, and render it certain that the bill, if reported at all, will be so changed that its authors would not know it. It was conceded that the bill, as it passed the House, would be plainly unconstitutional, according to decisions already made by the United States Supreme Court; that it required a departure from all the fixed principles of jurisprudence; and, while the principal object or the ostensible plea made for its passage was, that it afforded the only way of stopping what were claimed to be unjust collections on account of the driven-well patent, it would have an equally disastrous effect upon thousands of other patents. One Senator asked why the bill should not, with equal justice, be made to apply to copyright cases, and it was apparent that there was no reason why it should not as well as to all other causes of action, as an effective way to stop vexatious litigation; because it not only deprived the plaintiff of any remedy, but actually put it in the power of the defendant to punish the plaintiff, where, on the merits of the case, the latter had been sustained.

Although influential supporters, and a certain number of votes in both Houses, can always be had for any measure which proposes to give infringers of patents a wider latitude, it is plain that the opposition to the driven-well patent at the West furnished the principal means by which this measure was passed through the House. This patent was obtained in 1866, after having been put in interference with two others for the same purpose; it was sustained by the Commissioner of Patents, and by the Supreme Court of the District of Columbia, but the controversy here gave the first opportunities for misrepresentation as to the validity of the patent, and, very soon afterward, driven wells began to be put down by parties not having the authorization of the patent which had been declared valid. It was not until 1871 that, in the hands of parties financially strong, earnest efforts were made to vindicate the rights of the patentee, and then a suit was commenced for this purpose which did not come to a decision till April, 1876, the testimony alone covering 2,800 printed pages, and the arguments being very exhaustive. During all this time the owners of the patent did not ask any royalty from users of the well, and, had the decision been against them, never could have collected anything. Upon getting a decision in their favor they immediately commenced to collect, but were met by such opposition that two more suits were necessary, one in Minnesota and one in Indiana, in both of which the patent was sustained. And now we come to the point which has given rise to all the excitement about the matter. The patentees gave notice that they wanted ten dollars from each unauthorized user of a driven well, but would make a deduction of one-half for all who voluntarily paid within twenty days.

Suits were commenced against those who did not, the Minnesota lawyers having at one time over four hundred suits commenced, and in these cases they made the royalty *and costs* come to $46.50 in each suit. The patentees did not receive any more than their royalty, but the case was one in which the lawyers had an opportunity for fine pickings, and the public was justly incensed. After a good deal of delay and trouble the patentees were enabled to place their business in different hands, so the costs might be made more moderate, but the excitement had commenced, and, it being found that no relief can be had through the courts, the patent having been everywhere sustained, a rush was made to obtain favorable legislation by Congress. The feeling in many quarters was, perhaps, something like that against the Chinamen in San Francisco, when the populace demanded the abrogation of a national treaty and the passage of laws that were unconstitutional, because they declared "the Chinese must go," but, unjust and oppressive as the collection of such costs were in these cases, it is not likely that the agitation against patents will be any more successful than was that against the Chinamen.

What was really aimed at was to get rid of the enormous costs of the law suits, to regulate a mode of practice, but it will not do to strike down the patentee for this purpose. As was said before the Senate Committee· "Like any system of law, it will cause occasional inconvenience and occasional hardships in particular cases; like every system of law it will sometimes be badly administered. The question at the bottom of all propositions for amendment is, whether we shall amend it so as to cut off the evils, at the same time preserving its substance, its purpose, and its spirit, or whether we should cut off any evil that we find to exist, any annoyance or inconvenience that arises under it, without regard to whether such change virtually destroys the life of the system or not." The patent law undoubtedly has its defects, but if we cannot remedy them without destroying its life we must submit, Western farmers as well as other men.

SOME ELECTRICAL MEASUREMENTS OF ONE OF MR. EDISON'S HORSESHOE LAMPS.

BY HENRY MORTON, PH.D., A. M. MAYER, PH.D., AND B. F. THOMAS, AT THE STEVENS INSTITUTE OF TECHNOLOGY.

(Additions and corrections to article on page 241.)

In reading the above named article in print we notice some errors which require correction and some points calling for a more full explanation.

In the second column, ninth line from top, it is said that the *loss* of weight in one of the electrodes was 1·0624 grammes.

This was, in fact, the amount *gained* by the cathode, the loss of the anode being a trifle greater. The gain of weight was, of course, what it was intended to take, so that the error was only in the expression, and not in the process or result.

In the next place, in the foot note at the end of the same column, it is simply stated that the average of the maximum and minimum lights in azimuths at right angles and in the plane of the loop was taken as the average luminous power of the lamp. Our reason for this, however, was not mentioned, but was, in fact, that we found by measuring the light at every azimuth varying by ten degrees between 0° and 180°, that this was approximately the true expression for the total amount of light emitted. We see from the article of Profs. Rowland and Barker, in the *American Journal of Science*, that they, assuming certain conditions and discussing the same in a mathematical manner, have reached a different result; but as experiment shows this result not to be attained in fact, it is evident that the assumptions on which the mathematical reasoning is based do not include all the conditions present in the experiment.

Two other sets of experiments, made since those given in our paper of April 17, in which the candle power of the loop was in its best position, 17·6 and 19·8 candles, corresponding to averages of 11·7 and 13·2 candles respectively, showed a consumption of energy of 0·104 and 0·109 horse power per lamp, or 9·6 and 9·1 lamps per horse power. This would give 112 candles and 120 candles respectively per horse power of electric energy consumed or transformed in the lamp. These results certainly agree very closely with each other and with our former determinations.

The Philadelphia Wool Exhibition.

The International Exhibition of sheep wool and wool products, under the auspices of the Pennsylvania State Agricultural Society, will be held in the Permanent Exhibition Building, Fairmount Park, in September next. It is said by the officers of the society that the money realized at the fair held last year will enable them to offer unusual premiums for all classes of stock and machinery. Replies to circulars and letters addressed to prominent stock growers throughout the country already indicate that the exhibits will be so numerous that it will be difficult to accommodate them all, unless the exhibits already in the building are packed close together. The aggregate of prizes to be offered is $40,000, including $8,500 for cattle, $7,000 for horses (racing prohibited), $6,500 for sheep, $3,000 for swine, $1,500 for poultry, $2,500 for the dairy, $4,000 for tools, implements, and machinery, $3,000 for State, county, club, and individual exhibits of farm, orchard, and garden products, and $4,000 for wool and wool products and other manufactured goods. The sheep prizes are, for flocks $450 and $250, and for ram and five of his get, $250, $200, etc. No officers or members of the State society will be appointed for service on the juries of award.

Heavy Patent Damages.

In the United States Court, Rutland, Vt., Judge Wheeler granted a decree giving judgment for the plaintiff for $161,011.71, in the suit of Riley and Burdett against J. Estey & Co., organ manufacturers of Brattleboro. This action was originally brought several years ago to recover for the alleged infringement of a patent in the manufacture of organs. It was heard before the late Judge Johnson, but his death occurring before a decision was given, necessitated a reargument. This was had before Judges Blatchford and Wheeler, who found for the plaintiff and referred the case to ex-Governor Stewart, of Middlebury, with directions to compute the amount due. Governor Stewart reported in favor of awarding Mr. Burdett $149,039, to which Judge Wheeler has added interest from December 4, 1878, making the total judgment over $160,000. The defendants will appeal to the Supreme Court.—*N. Y. Sun.*

Progress in Walking Matches.

It is but a few years since 500 miles were considered a great achievement in six-day walking matches. When the limit was pushed to 550 miles, it was thought that the extreme verge of human endurance had been reached. That distance was exceeded by a fraction over fifteen miles by Hart, in the recent contest in this city; and it is not a wild prediction to say that an average of one hundred miles a day for six days will soon be made; probably by some swift and enduring walker, who will not be allowed to exceed 100 miles in any one day.

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Delicate Test for Albumen.

To Mr. Siebold belongs the credit of having introduced a modification of the heat test, which is adequate to the detection of albumen under conditions in which its presence might be completely overlooked. The following is the author's own account of the manner in which the test is to be applied:

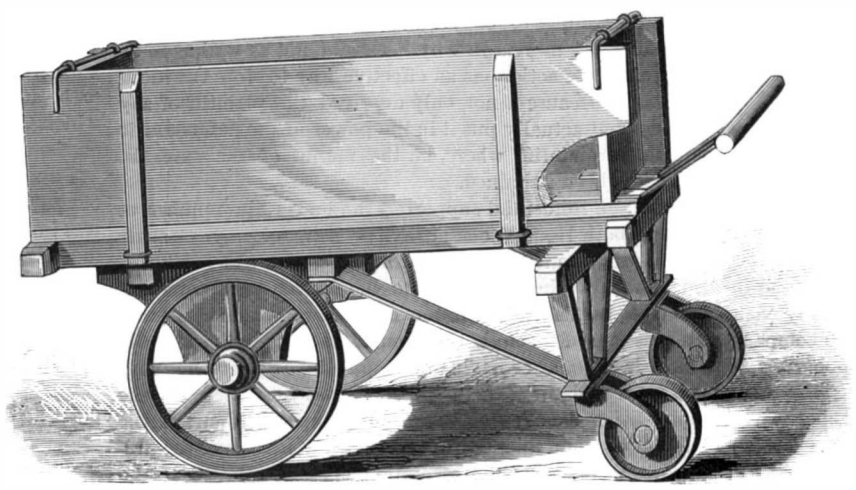
"Add solution of ammonia to the urine until just perceptibly alkaline; filter, and add diluted acetic acid very cautiously until the urine acquires a faint acid reaction, avoiding the use of a single drop more than required. Now place equal quantities of this mixture into two test tubes of equal size, heat one of them to ebullition, and compare it with the cold sample contained in the other test tube. The least turbidity is thus distinctly observed, and gives absolute proof of the presence of albumen."

A NEW WAREHOUSE TRUCK.

We give an engraving representing an improved truck for mills, warehouses, railroad depots, etc., recently patented by Mr. Montgomery A. Reynolds, of Stanton, Mich. The truck frame is mounted on two large wheels turning on an axle located a little behind the middle of the truck, and is supported in front by two caster wheels whose pintles turn in a stout iron frame hung from a crosspiece attached to the under side of the truck frame near the forward end. A handle is attached to the forward end by means of two strong iron arms.

The platform is provided with side boards and end boards, which may be used or not as occasion requires. Each end board has along its upper edge an iron rod which is bent downward at the ends so that when the end boards are in place the end of the rods may be turned down over the side boards and thus prevent them from being pressed outward when the truck is loaded. The truck, as its appearance indicates, is strongly built and intended to do good service wherever an article of this kind is required.

We are informed that these trucks will be exhibited at the Millers' Exhibition to be held in Cincinnati, Ohio, early in June.



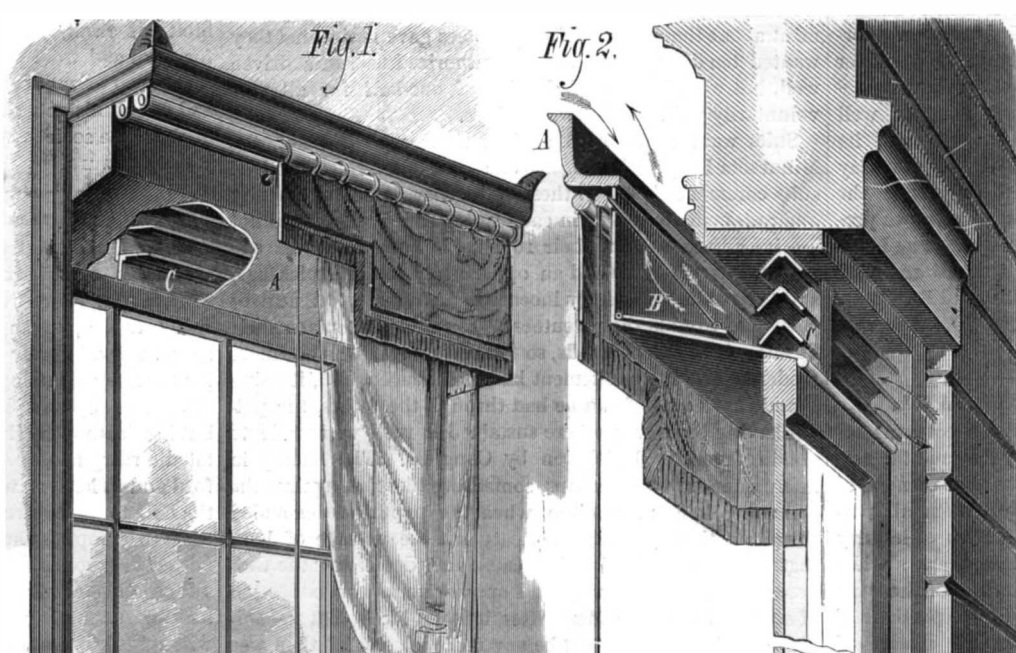
REYNOLDS' IMPROVED TRUCK.

A NEW VENTILATOR.

The accompanying engraving represents an automatic house ventilator recently patented in the United States and Canada by Mr. Walter S. Sayers, of Guelph, Ontario, Canada. This invention is intended to overcome in the simplest and most effective manner all of the difficulties which have stood in the way of ventilating from the top of windows without draughts of air on the occupants of the apartments. This ventilator is independent of either sash, and does not interfere with lowering or raising them, it does away with the necessity of hanging them with weights for the purposes of ventilation, and does not in any way interfere with hanging the curtains in the usual way. The ventilator is completely hidden from view in the interior of the room by the curtains or lambrequins, and on the exterior of the building it presents the appearance of a neat Venetian blind above the sash, and is an embellishment rather than otherwise.

For windows in public buildings, offices, etc., where curtains are not used, the ventilator affords a good ground for stucco designs or other ornamental work. This ventilator admits pure air into the room without draughts; the air entering the room at the top of the window is directed by the air duct toward the ceiling, where it is distributed, displacing the vitiated air, which escapes by the ventilator. It is entirely automatic and requires no attention; the wind, on reaching a certain velocity, closes the pivoted guards, C, and prevents very strong currents of air from entering. The guards also exclude dust, and when the pressure of the wind diminishes the guards swing open automatically. If at any time it is desired to close the ventilator—and this will happen very seldom—it may be done by closing the valve, B, which is worked by a cord hanging down at the middle of the window. The valve opens by its own weight, when the cord is released. To prevent the entrance of flies and insects a netting is placed over the cornice board, A.

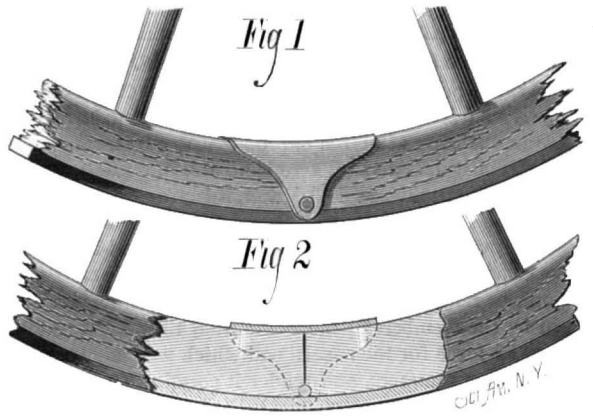
This ventilator can be used in connection with Venetian blinds or winter sash, as it does not in any way interfere with them. The inventor informs us that he has had this ventilator in use in his own residence for the last eight months, giving the most complete satisfaction. He also states that it is indorsed in the highest terms by physicians who have seen it. Further information in regard to this useful invention may be obtained by addressing the inventor and patentee.



SAYERS' AUTOMATIC VENTILATOR

IMPROVED FELLY PLATE.

The annexed engraving shows an improved attachment for vehicle wheels, which is intended to strengthen the felly joints and at the same time keep the tires in place on the wheels. The device is exceedingly simple, being nothing more than a curved plate fitted to the rounded portion of the felly over the joint and held in place by a single bolt passing through the joint near the tire. The extreme ends of the plate project over the edges of the tire and prevent it from running off should the wheel shrink.



CREMER'S FELLY PLATE.

Fig. 1 shows a portion of a wheel with the felly plate applied, and Fig. 2 is a sectional view of a felly taken through the joint, showing the position of the plate in dotted lines.

Further particulars in relation to this invention may be obtained by addressing the inventor, Mr. Charles Cremer, Cosumne, Cal.

Boracic Acid in Eye Diseases.

Dr. Saml. Theobald calls the attention of the profession, in the *Medical Record*, to the astonishingly favorable results which he has obtained from the use of boracic acid in the treatment of various affections of the eye; and, from these results, he feels constrained to say that this remedy must, ere long, obtain a position in ophthalmic therapeutics second only to that of atropia. Biborate of soda (borax), as well known, has long entered as an ingredient in popular remedies for the eye; and the use of boracic acid itself is not by any means as new as Dr. Theobald seems to suppose. It does no harm, however, to occasionally call attention to the value of old remedies, and which might otherwise be overlooked or forgotten.

Butter and Cheese by Machinery.

In our last issue we gave considerable space to the illustrations and description of the manufacture of oleomargarine. We now publish from a correspondent of the Philadelphia *Ledger* an account of the process of making butter and cheese on a large scale from fresh milk:

"The milk is brought to the creameries in the morning, and after being weighed, is run into long vats to undergo the process of raising the cream. In the center of these vats is a pipe about three inches in diameter, and in which are smaller pipes, through which cold water is forced by steam power, thus keeping the milk cold, and causing all the cream in the milk to rise to the surface in from three to four hours' time. The milk is then drawn from the vat, leaving the cream behind. The cream is then placed in churns, each holding about one hundred gallons, which are moved by steam power until the butter is formed, the time required being about thirty minutes. The churns have only two revolving wings, instead of four, as used in the ordinary hand churn. The churn is not moved at any greater speed than in the old process, but a regular and uniform motion is kept up until the work of bringing the butter is completed. The butter, after being removed from the churns, is placed upon tables and worked by hand, a round bar being used. The work can be done by machinery, but in most of the creameries the process by hand is preferred. The skimmed milk is taken to the cheese department and placed in large tin vats, and hot water, instead of cold, is forced through the milk in which rennet has been placed to make it curdle. When this process is completed, the product is put in boxes holding thirty-five pounds, and pressed. It is then stored for about thirty days, when it is ready to be sold in the market as cheese.

"The first creamery in the State, it is said, was started less than a year ago at Quakertown, Bucks County, and now some fifteen of them, and more new ones are talked of. The establishments are generally owned by companies, the capital required to start one of the capacity of 4,000 quarts daily being from $4,000 to $6,000. What effect these establishments will have upon the supply of milk to consumers in large cities, or its price to them, has yet to be seen. At all events, the experiment of making butter and cheese by the processes described above is fully under way, and it will not take long for the parties interested to ascertain how much profit there is in it. At present, the great want in the establishments is milk enough to run them to their full capacity, but this want, no doubt, will be met as the farmers gain a knowledge of the demand."

Paper Leather.

The *Paper World* describes a new kind of paper sizing which promises to be exceedingly useful. It is considerably cheaper than ordinary size, and it has the merit of making the paper waterproof without discoloration. In one experiment one hundred and eighty-five pounds of leather board were manufactured from hemp, which was made nearly fine in the engine, and then the new sizing added, mixed, precipitated, and beaten fine. The thin, endless sheets were woven around a cold cylinder, and when of sufficient thickness, cut, removed, and dried in the sun. Strips one-fourth of an inch thick, when dry and before rolling, were as pliant as most sole leather, and could be bent square over without cracking. This leather board can be made insoluble in either hot or cold water. A piece of it not perfected, and not wholly impervious to water, one-fourth of an inch wide, cut lengthwise of the fiber, held up seventy-seven pounds stone. By rendering the same board insoluble, the strength was increased from seventy-seven to two hundred and eleven pounds. Leather paper of less thickness, made in the same manner, is described as pliable, somewhat elastic, apparently durable, and suitable for the uppers of shoes.

ONE of the cars of the Edinburgh and Glasgow Railway which fell from the Tay Bridge, was picked up several weeks after the disaster by fishermen on the western coast of Norway.

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Hardening Small Tools.

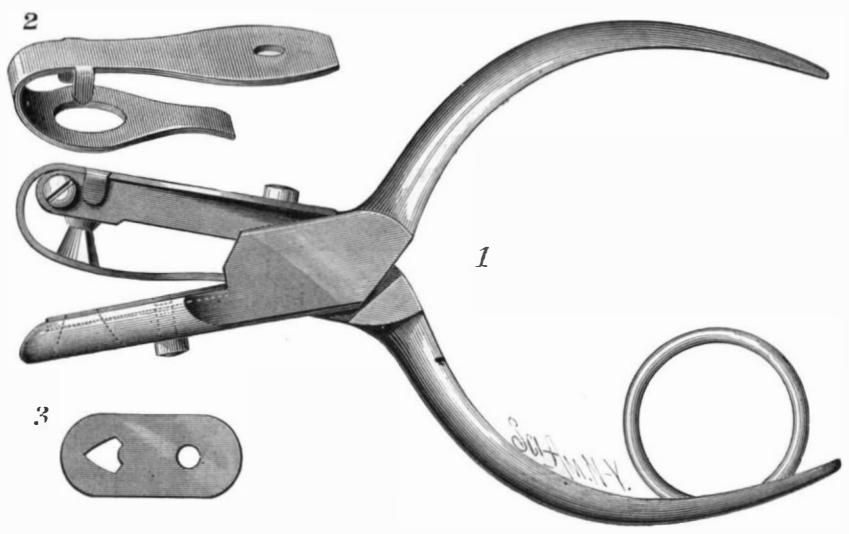
It is said that the engravers and watchmakers of Germany harden their tools in sealing wax. The tool is heated to whiteness, and plunged into the wax, withdrawn after an instant and plunged in again, the process being repeated until the steel is too cold to enter the wax. The steel is said to become, after this process, almost as hard as the diamond, and when touched with a little oil or turpentine the tools are excellent for engraving, and also for piercing the hardest metals.

NEW TICKET OR CANCELING PUNCH.

The superiority of this punch over others consists in the manner in which the dies are inserted in the punch and the interchangeability of the various parts, as illustrated in the accompanying engraving. Canceling punches are usually made with one or both dies cut out of the jaw of the punch itself, thereby necessitating the purchase of a new punch when the dies become worn, or a change in the die is required. In the punch illustrated the dies can be easily and cheaply repaired, or changed to a different design.

The uses to which the canceling punch can be applied are already very large and daily increasing. There are over three thousand railways in the United States, all using some sort of a canceling punch. Banks, counting-houses, grocers, eating houses, and all branches of trade in which canceling punches can be used to advantage, are adopting them.

All the detachable parts of the "Aiken ticket punch" are made of the finest cast steel and carefully tempered, thereby guaranteeing the longest wear that is possible to be obtained. The punches are highly finished and nickel plated. Many of the first railroads in the country have adopted them, and we are informed that all without exception pronounce them to be the best punch in use. Further information may be obtained from the patentee, Mr. J. B. Aiken, Franklin, N. H.



AIKEN'S TICKET PUNCH.

Consolation for the Bald.

Professor Fournier, in a lecture on alopecia, says of baldness: "There is nothing ridiculous or malformed about it, and it confers upon the physiognomy an expression of wisdom, experience, and venerability. It adapts itself marvelously to certain heads which would be deformed by a wig, and is the severe beauty represented in sculpture by the classic head of Æschylus."

NEW HOSE CARRIAGE.

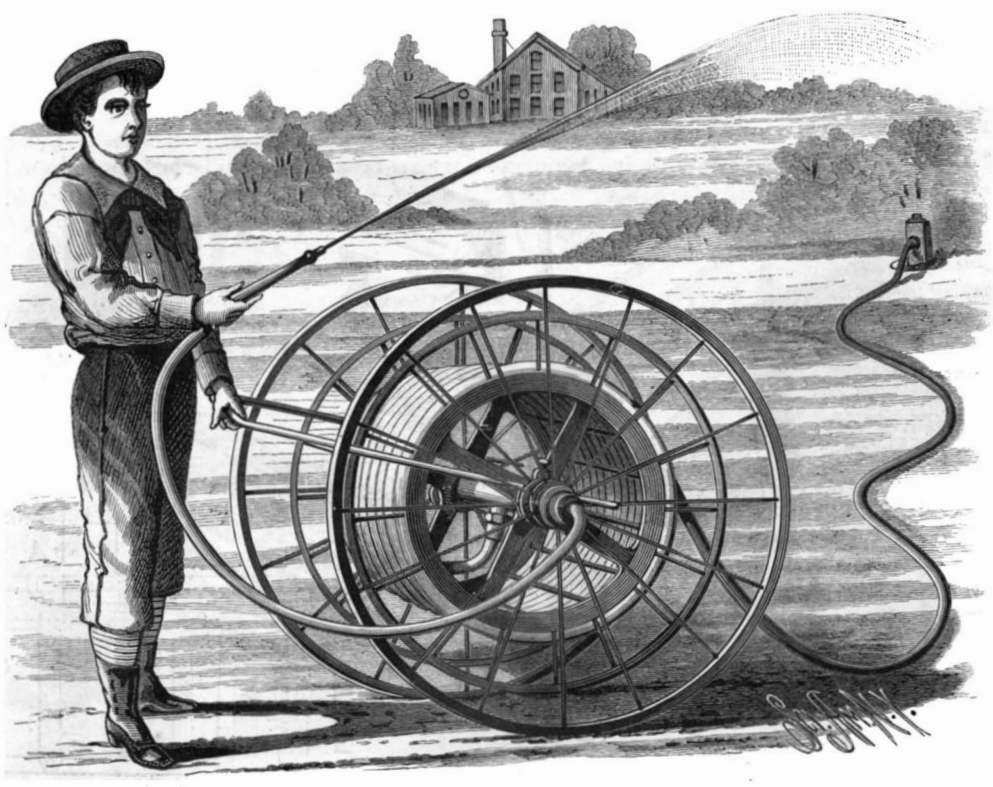
Any one fortunate enough to possess extensive grounds knows only too well the difficulties of keeping the lawns and gardens in prime condition; one of the principal troubles experienced is that of properly irrigating the grounds. The device shown in the annexed engraving fills a need that has been long felt, and supplies a means of watering grounds thoroughly and conveniently.

The novel feature of this carriage is the arrangement by which water is conveyed through the hose connected with the hydrant to the hollow axle of the carriage, and the manner in which it is distributed by means of the short service pipe held in the hand.

The reel on which the hose is wound is secured to the hollow axle of the hose carriage, and when the reel is revolved in winding up or unwinding the hose, the hollow axle turns in the hubs of the hose carriage wheels. The inner end of the hose is connected with a nipple projecting from the hollow axle. The outer end of the hose is provided with a union or coupling for connecting it with a hydrant from which the water is taken. The water passes through the hose as it is wound upon the reel, thence to the hollow axle, and out through the service pipe. The latter is connected with the axle by a swivel joint, so that the turning of the axle does not affect the service pipe. By taking the handle of the hose carriage in one hand and the service pipe in the other, one may walk along watering flowers, plants, or grass, on either side, as far as the force of the water will carry the spray. In this way one section after another may be watered without difficulty. The inventor informs us that a child ten years old is capable of using one of these carriages and taking the entire charge of it. The hose carriage has been thoroughly and practically tested, and has proved itself a complete success. A carriage of the size illustrated will hold 400 feet of three-quarter inch hose, or 300 feet of one inch hose; with these lengths a plat from 600 to 800 feet in diameter may be irrigated without disconnecting the hose from the hydrant.

Where this hose carriage is adopted dragging the hose is entirely avoided, and the hose never kinks, but is always laid smoothly, and may be taken up very easily without the usual wear and tear of the usual methods of handling.

The wheels of the hose carriage are 36 inches in diameter. The reel wheels are made somewhat smaller, so that they will not touch the ground. The entire carriage is made of steel, iron, and brass, and is practically indestructible. They are made in various sizes to suit the requirements of different users. Further information may be obtained by addressing the inventor and patentee, Mr. J. B. Aiken, Franklin, N. H.



AIKEN'S NEW HOSE CARRIAGE.

A New Compound.

A new metallic compound, applicable to many artistic and industrial purposes, has been recently announced in England. The substance belongs to the class known as the thiates or sulphur sulphides. Nearly a year ago Mr. J. Berger Spence discovered that sulphides of metals combined with molten sulphur formed a liquid. This liquid on cooling became a solid homogeneous mass, possessing great tenacity, and having a peculiarly dark gray, almost black color. It has a comparatively low melting point, namely, 320° Fahr., or rather more than 100° above the temperature of boiling water. It would thus require only a small amount of fuel to reduce or to melt it. The new compound also expands on cooling—a property not shared by the majority of other metals or metallic compounds. For such purposes as joining gas or water pipes this expansion is of great importance. It is also claimed that the new compound resists favorably atmospheric or climatic influences, as compared with bronze or marble, and that its resistance to acids is much superior to that of other metals or metallic compounds. These qualities, if sustained by further experience, would certainly render the new compound very useful in many ways.

A California Tunnel.

The longest of the series of tunnels on the South Pacific Coast Railway, in the Santa Cruz mountains, California, has just been completely pierced. The tunnel, which is over a mile in length, was begun a little over two years ago. The presence of petroleum in the formation has resulted in several disastrous explosions, involving many delays and considerable loss of life.

A New Way of Heating Railway Carriages.

French railway cars are warmed by means of hot water bottles; that is to say, cases made of iron, about three feet long, six inches wide, and four inches thick, which are filled with hot water and put on the bottom of the car for passengers to place their feet upon.

It is reported from Lyons that the Compagnie Paris-Lyon-Méditerranée is now trying a new method of heating in express trains. The method was proposed by M. Ancelin, an engineer, and consists simply in the use of acetate of soda in the foot warmers. The substance has considerable latent heat; dissolving at a certain temperature, it thus absorbs a large quantity of heat, which becomes sensible during crystallization in cooling. All that is required is to fill the ordinary cases with a sufficient quantity of the acetate, close them, and place them in a stove at about 100°. The cooling of a case thus charged and heated takes twelve to fifteen hours. The warmers are thereafter taken from the compartments and placed in a stove (where the crystals of soda acetate are re-dissolved); they are then ready for fresh use. The advantages of such a system are obvious—no necessity of changing warmers every two or three hours, or of maintaining a numerous body of men at stations to attend to them; economy in cost of heating, etc. Moreover, most of the existing foot warmers can be utilized. Acetate of soda is not very expensive, and it could easily be manufactured in much larger quantities than at present if the demand required it. The new system has been tried on the express train No. 5, leaving Paris at 7: 15 and reaching Perrache at 4: 31. The compartments were each supplied at starting with two warmers containing acetate of soda. At Perrache most of the warmers were still so hot that one could not apply the back of the hand to them. From Lyons to Marseilles the train was heated on the ordinary system.

Charles T. Chester.

Charles T. Chester, inventor and electrician, died recently at his residence in Englewood, New Jersey, at the age of fifty-four. Mr. Chester was for a number of years engaged in the manufacture of electrical apparatus in this city. He is best known as the inventor of the fire-alarm telegraph and originator of the law-telegraph system. At the time of his death he was electrician to the National Electric Light Company.

Mycenæ.

With respect to Dr. Schliemann's discoveries at Mycenæ, the Russian *savant*, M. Stephani, has expressed opinions which have attracted considerable attention in Germany. The learned academician by no means disputes the great antiquity of many of the individual objects unearthed by Dr. Schliemann, but he holds that the remains include objects belonging to very different eras of history. He contends that the date of the tombs must be determined by the latest products of art or industry which have been discovered in them. The seal ring is especially important in this respect, as, according to his view, it is executed entirely in the style of the New Persian art. He is of opinion that the tombs originated with the barbarians who invaded Greece in the third century B. C., and made the citadel of Agamemnon one of the chief centers of their dominion. Here he believes they buried their chiefs, and decorated the tombs partly with such ancient relics of an earlier date as had fallen into their hands and partly with ornamental objects produced in their own times.

A Town Lighted by Electricity.

Wabash, Ind., boasts of being the first town to adopt the electric light for general illumination. A beginning was made March 31, with four Brush lamps of 3,000 candle power each suspended on the flagstaff of the court house. A seven horse-power generator supplied the electricity. The contract called for a light equal to a gas burner at a distance of 2,640 feet from the lamps. The tests were said to be satisfactory. Many visitors from adjoining towns were present to witness the first trial of the new method.

THE following is the way the newspapers in the mining regions talk to their readers:

"A man at Dutch Flat picked up a rock, the other day, to throw at a cow. The weight of it attracted his attention, and on examination it was found to contain over a hundred dollars in gold."

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The Exodus from Europe.

The prophecy of the Commissioners of Emigration that the current year would see a marked increase in the number of immigrants arriving from Europe is being fulfilled with a liberality quite unexpected.

The total number of immigrants who came to this port in 1879 was 175,589, which was very largely in excess of preceding years, being 59,723 more than in 1878, which exceeded 1877 by 20,811. During January and February of 1879 the arrivals numbered 5.143, while for the first two months of this year the aggregate was 13,765, an increase of 8,622. These are invariably the two lightest months in the year. During March, 1879, the record shows 6,085, while for the month just closed this year the official figures are 21,090, an enormous increase of over 15,000. During the first quarter of the present year there was landed 34,855, against 11,052 in 1879. A heavier immigration is expected this summer than ever before. The new arrivals are chiefly Germans. Since the Commission was organized in May, 1847, Germany and Ireland have sent in about equal numbers, the total figures to the close of 1879 being, for Germany, 2,195,398, and for Ireland, 2,042,046. This year, during January and February, the proportions were—Germany, 3,577; Ireland, 2,597. A large immigration will undoubtedly come from Ireland on account of the famine, but it has not yet set in.

The applications for newly arrived laborers are largely in excess of the supply; and, curiously, the number of immigrants registered as seeking employment is smaller than it has ever been in recent years. With the exception of the Hungarian arrivals, nearly all have definite plans for the future. They have money and friends, and usually go West to situations procured in advance by their countrymen resident here. The demands for immigrant labor are mostly for Germans, Swedes, and Scotch; but Superintendent Jackson says that, among these nationalities, scarcely one in a hundred stops at New York to seek employment.

NEW BOX MACHINE.

We give herewith an engraving of an improved machine for cutting box blanks from a block of wood, and at the same time grooving them preparatory to bending them into forms for making the rectangular sides of a crate or box, as shown in the engraving.

Fig. 1 is a perspective view of the complete machine, showing also the bed plate and knife detached. Fig. 2 is a vertical section taken through the block-holding and cutting mechanism.

In the wide end of the main frame of the machine is arranged a knife, D, with its edge inward. This knife is firmly secured to the solid bed frame, so that it will not be liable to bend under a heavy strain. In front of the knife there is a gauge plate, which is movable lengthwise, being adjusted in this direction by a screw.

This gauge plate supports the plate, D, which carries a series of cutters for forming transverse grooves in the box blanks. The gauge plate has a series of wedge-shaped projections on its upper surface, which correspond to a series of cavities in the under surface of the cutter plate, so that when the gauge plate is moved lengthwise by means of its adjusting screw, the cutter plate will be raised or lowered, as may be required, thus governing the thickness of the blank. The cutter plate is clamped firmly to the bed of the machine by two screws passing through slots in the gauge plate.

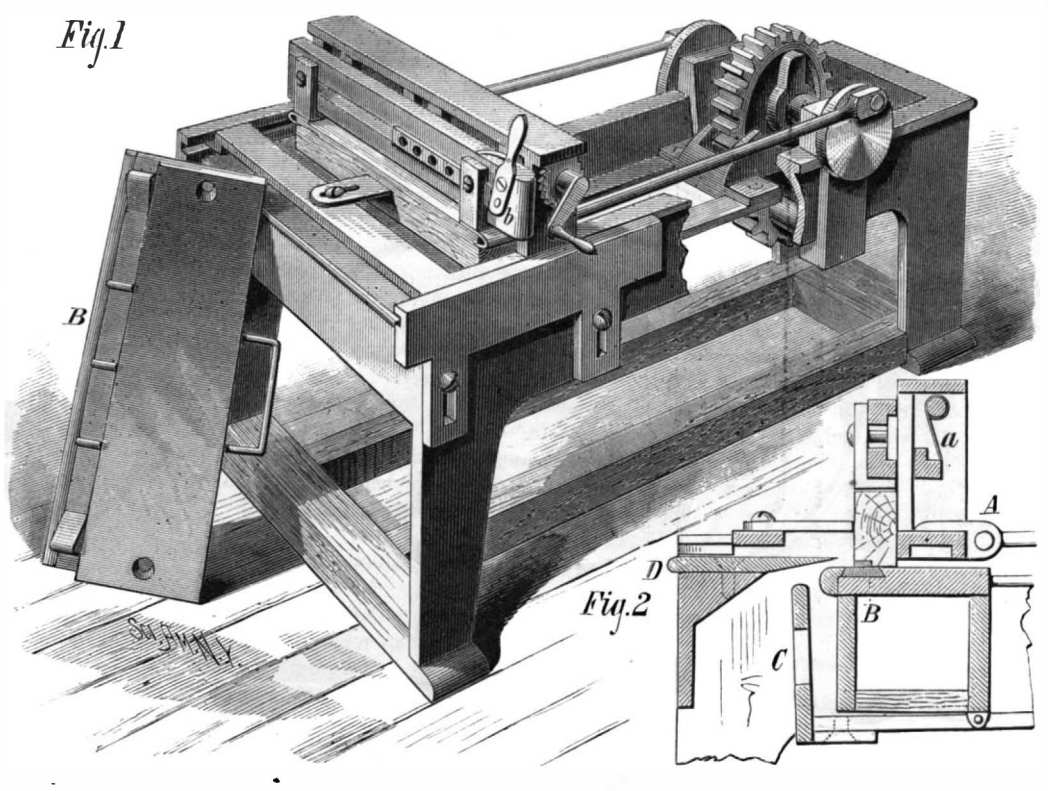
The cutter plate, B, is provided with the convex cutters for forming the transverse grooves in the box blanks, and also with inclined cutters for chamfering the ends of the blanks.

A traveling block-holder, A, moves over the bed of the machine and carries the block from which the box blanks are cut, back and forth over the knives in the bed, cutting at each forward movement a blank suitable for making a box like that above described. The block is held in place by a clamp, *b*, attached to a weighted follower that continually presses the block downward and feeds it automatically to the knives.

Whenever it is desirable to raise the weighted follower, it is done by turning a small windlass, *a*, journaled in the block-holder, and provided with a ratchet for holding it when required. The proper reciprocating motion is given the block-holder, A, by means of cranks and connecting rods connected with opposite ends. A check or holder, C, pivoted in the lower portion of the bed, is made, by an ingenious cam arrangement, to rise at each cut and support the blank. The machine is entirely automatic after the block is put in.

The machines are strongly built, and turn out the blanks very rapidly. They are made in various sizes; the largest made up to this date are 56 inches in width, but they may be made much larger. The only limit to the size is the length of the knife. A 56-inch machine will cut blanks for boxes from 9 by 18 inches by 10½ wide down to the size of a match box.

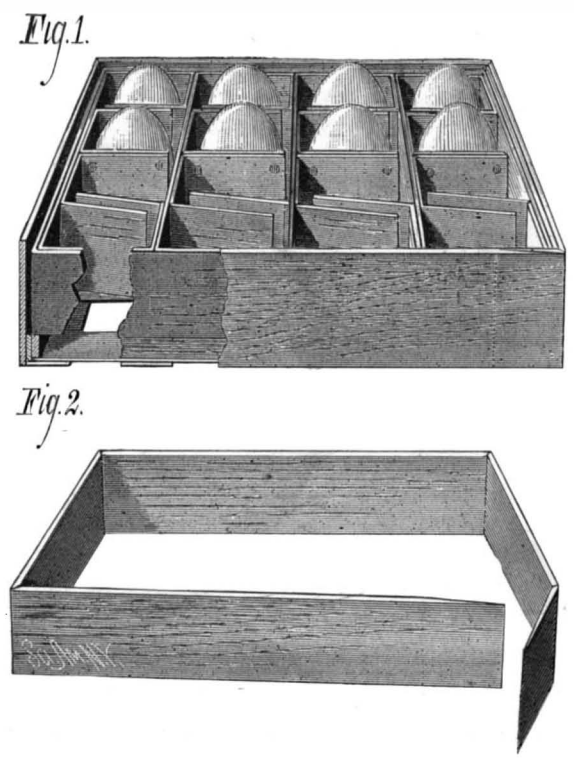
This machine was recently patented by Mr. William Huey, of Cambridge, Md. Further information will be furnished by Mr. J. D. Richards, Box 43, Cambridge, Md.



HUEY'S BOX MACHINE.

NEW EGG CARRIER AND CRATE.

The engraving represents a novel egg crate and carrier recently patented by Mr. William Huey, of Cambridge, Md. The blanks for the crate and for the carrier are both made on the machine shown on the lower part of this page. These



HUEY'S EGG CARRIER AND CRATE.

blanks are sliced from a block of wood, and the transverse grooves which admit of making the boxes with bent joints at the corners, and with the adjoining ends lapped so as to form a strong yet perfectly smooth joint. Fig. 1 shows the egg crate and box with portions removed to show their construction, and Fig. 2 shows a box blank bent at the corners and about to be joined at the ends. In forming the box the inventor bends the shorter of the beveled ends inward until its outer side inclines to the angle of the cut on the other end. By this arrangement, if the parts are to be glued, the glue is not applied to the ends of the grain on both sides of the joint, and a strong joint is secured.

The arrangement of cells shown in Fig. 1 is designed for transporting eggs and other fragile or perishable articles, and the device consists in a case formed with parallel partitions subdivided so as to form cells, by elastic wings secured on one side to the parallel partitions and overlapping their free ends to form expansible cells or pockets, for receiving and protecting the eggs.

The wings are formed of thin strips of wood made on the machine described below. The transverse groove formed in the blank renders the wood thin and springy at the joint.

The advantage of a crate of this character will be seen by shippers and producers of articles requiring carriers of this kind. It is inexpensive, durable, and effective.

Further information in regard to this useful invention may be obtained by addressing Mr. J. D. Richards, P. O. Box 43 Cambridge, Md.

The Manufacture of Dynamite.

The industrial production of nitro-glycerine, the base of dynamite, has been attended with no little danger, as many terrible accidents bear witness. Among the prizes recently awarded by the French Academy of Sciences is one of 2,500 francs to MM. Boutmy and Foucher, who, by introducing new modes of producing nitro-glycerine in large quantity, and by various precautions, have rendered the manufacture of dynamite much safer, so that in their works at Vonges no life has been lost during the last six years, and the general health has been excellent. In the old method, in which fuming nitric acid, or a mixture of this and sulphuric acid, is made to act on glycerine, and the mass is suddenly immersed in water, the reaction often produced heat sufficient to decompose a part of the nitro-glycerine, occasioning violent explosions (in spite of the refrigerating processes adopted). The principle of the new process consists in obviating the greater part of the heat by first engaging the glycerine in a combination with sulphuric acid, forming sulphoglyceric acid, and then destroying slowly, by means of nitric acid, the sulphoglyceric compound. Two liquors are prepared in advance—a sulphoglyceric and a sulphonitric (the latter with equal weights of sulphuric and nitric acid). These disengage a considerable amount of heat; they are allowed to cool, and are then combined in such proportions that the reaction takes place slowly. In the old method the nitroglycerine is separated almost instantaneously and rises in part to the surface, rendering washing difficult. In the new it forms in about 20 hours, and with a regularity which prevents danger. It also goes to the bottom of the vessel, and can be washed rapidly.

MECHANICAL INVENTIONS.

Mr. John H. Parkinson, of Virginia City, Nev., has patented improvements in air compressors especially adapted for use at mines. The object of the invention is to construct a simple and durable apparatus, which will occupy but small space and require but little power to drive it.

An improved axle box, patented by Mr. George W. Thomas, of Bear River, Nova Scotia, is applicable to carriage, wagon, car, and all other axles, and to all shafting. The invention consists in the combination with friction rolls of an axle box journaled in rings connected by diamond-shaped bars extending the whole length of box.

A novel and simple apparatus to be used in the process of making ice by the absorption or pumping of ammonia gas, has been patented by Mr. Andrew J. Zilker, of Austin, Texas. The invention consists of two or more sheets of galvanized iron or other metal set in a tank of fresh water, one on either side of the evaporation pipes, and held in a position parallel to each other by anchors or yokes that connect them.

An improved vise for holding circular saws while filing and upsetting their teeth has been patented by Mr. James L. Glover, of Windsor Locks, Conn. It is so constructed as to hold the saws firmly while being operated upon.

Mr. George E. Bigelow, of Geneva, Neb., has patented an improved water elevator which consists of a conical axle carrying a chain or rope to one end of which a weight is fastened, said axle supporting also a wheel or pulley which carries a chain or rope, one end of which is attached to the wheel and the other end to a bucket.

A metal bending tool for use of blacksmiths and others having occasion to form angular bends in metal bars or plates, a tool which will enable the work to be done much more easily, quickly, and economically than by the ordinary means, has been patented by Mr. Samuel Patterson, of Altoona, Pa.

Mr. William H. Hottel, of Woodstock, Va., has patented an improved alarm attachment for grist mills, designed to give a distinct alarm for indicating the irregularity of speed, whether in a mill or other class of machinery, which may be heard at any part of the mill, or which, by the aid of a telephone, may be heard at an office, residence, or other point remote from the machinery.

Messrs. Monroe Frank and Alfred Dickison, of Bowlusville, O., have invented an improved drag sawing machine, intended to be used by hand in sawing firewood. It is simple and well designed.

A stationary steam boiler, composed of hot water, steam, feed water, and air tubes laid horizontally, in coils or sections, one above another, in the order named, in a brick fire chamber, and having all the tube couplings and connections outside of the brick work, so that they may be readily got at for examination or repairs, and having also the steam and mud drums outside of the brick work, has been patented by Mr. Milton W. Hazelton, of Chicago, Ill.

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AMERICAN INDUSTRIES.—No. 41.

THE BRASS MANUFACTURE.

This department of metal working has, for several years past, been showing a steady and most wonderful growth, as a consequence principally of improvements made in machinery. The great ductility and malleability of brass—the ease with which it can be rolled, drawn, and hammered when cold—render it possible to use with great advantage, in working it, all kinds of modern punching and draw presses, and it is now employed in the making of an almost endless variety of articles in which its use was formerly unknown, or so small as to be quite insignificant.

Ordinary commercial brass, as now generally made, consists of two parts by weight of copper and one of zinc, though the proportions vary according to the quality of the brass. Zinc is a good deal the cheaper of the two elements, but it melts more readily, and burns off to some extent in the fusion. Copper melts at 2,200° Fah., and zinc at 770° Fah. The best quality of brass is that known as "low brass," which has a greater proportion of copper than the "high brass," which is the cheaper grade. "Low brass" now sells at four cents a pound more than high brass. With still less copper, and proportionately cheaper, we have "yellow metal" for bottoming vessels, etc. The composition of the latter varies as much as does that of brass, the proportions being from thirty-seven parts zinc to sixty-three parts of copper to equal parts of each. What is known as "German silver" is made by melting nickel, one-sixth to one-third in amount by weight, with brass. A small percentage of lead is sometimes used in brass, diminishing its ductility and increasing its hardness, one to two per cent. rendering the brass capable of being readily worked on the lathe, or filed, without clogging the teeth of the file. A tough brass for engine work is composed of twenty parts of copper to three of zinc and three of tin, while for heavy bearings a brass is made of thirty-two parts of copper to one of zinc and five of tin. "Pinchbeck" has generally about four parts of copper to one of zinc, and a white metal largely used for cheap table furniture, etc., has ten parts of copper to eighty of zinc and ten of tin.

In our illustrations to-day we show the principal operations of the brass manufacture, as conducted in one of the oldest establishments of this kind in the country, and one of the largest in the world, that of the Benedict & Burnham Manufacturing Company, at Waterbury, Conn.

The "casting" is the first operation, as illustrated in the middle of the first page at the right hand side, where an interior view of the foundry is given. The foundry building is 50 by 100 feet in size, and across the middle, from side to side, runs a bank of small, low furnaces, twenty-one on each side, giving facilities for the melting of forty-two crucibles of metal at a time. The casting done here consists almost exclusively in the making of small slabs for rolling into sheet brass, flat bars for rolling and then drawing into wire, and hollow cylinders from which seamless tubing is made. Comparatively few articles are now cast in brass, as the metal can otherwise be worked with such facility that the old methods of manufacture are mostly done away with. The crucibles are of a size to hold from one hundred to one hundred and thirty pounds of metal each; in these are placed the desired proportions of copper and zinc, by weight, or of old metal or scrap, great care being taken to maintain the exact relative proportions of each, which requires close attention, as the zinc burns off rapidly at the heat required to melt the copper. The crucibles, when charged, are covered with charcoal and set in the furnaces, which are fitted with sliding plates to close the top, each furnace having an aperture at the back communicating with a tall stack, which carries off the volatile results of combustion and fumes of zinc. When the metal has been properly fused it is poured direct from these crucibles into the moulds, which are of iron, held together by clamps. The copper used is principally from the Lake Superior ore. The company have a high reputation for the excellent quality of their metals, as their long experience in the business has enabled them to overcome many difficulties which formerly existed in making just the desired combinations. They have some workmen in this branch of the business who have been in their employ upward of a third of a century.

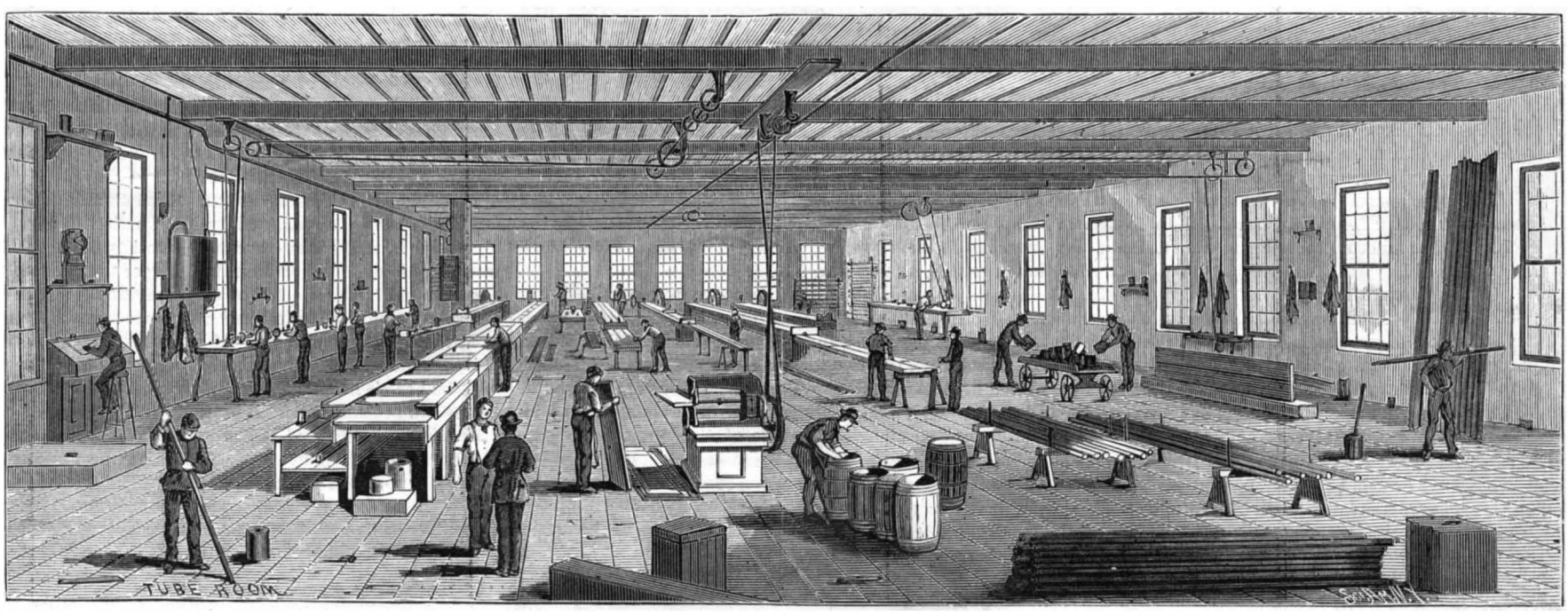
The large illustration across the top of the page shows the department where both the slabs for sheet brass and the flat bars for wire are rolled. The first operation here is to trim off the edge left rough from the mouth of the mould, and for this purpose immense shears are used, the working arm of one pair of which will weigh as much as a ton; this is worked with a powerful leverage, so that the thick bars and slabs of brass are trimmed off as easily therewith as a paper doll would be cut out with ordinary scissors. The huge rollers, arranged in gangs, are of different sizes, sixteen pairs being in operation. They work in iron frames of the greatest solidity, the motion being given by a loose or flexible joint, to admit of the upper roller being set at varying heights for the different thicknesses to which the brass is to be rolled. In some of the rolling one hundred and fifty horse-power is at times required to drive a single pair of rollers, and, strongly as they are built, they sometimes break under the great pressure they have to bear. Little streams of water are constantly pouring over them when in operation, and the first "squeeze" which the slab or bar of cast brass receives reduces its thickness by about a sixteenth of an inch, or rather more than is effected by each successive rolling thereafter. This operation, the metal being successively passed through the rollers, is continued, for sheet brass, until the plates are reduced sufficiently thin for any purpose desired, but the bars intended for wire are only rolled down to about half an inch thickness, the size from that point being diminished by the drawing.

The "annealing," as shown in the view on the left in the middle of the page, is conducted in six large ovens heated by wood. The fires are on each side of a space about five by eighteen feet, where the bars and slabs of metal are laid, after each successive rolling, until heated to a red heat, and thence drawn out to cool slowly in the air. The metal, by the compression of the rolling or drawing, becomes comparatively hard and brittle, but the annealing restores its former softness and pliability. Chestnut wood is used for heating the annealing ovens, some four thousand cords a year being consumed in this way. After each process of annealing the metal is subjected to a bath of dilute sulphuric acid, the acidity to the tongue being about equal to that of lemon juice, which removes the tarnish given by the heating.

The "overhauling" or scraping, as shown in the view in the middle of the page, is something of an "inspecting" operation for all roll and sheet brass. This is done only before the final rolling, and is intended to remove all spots or imperfections, so that the brass, as it comes from the rollers the last time, will be as nearly perfect as possible. A great portion of this work is done by hand, but our representation shows some machines for this purpose, in which small scrapers are guided by the hand of the operator to scratch over and clean the surface of the metal where necessary.

Wire drawing is shown in the large view at the bottom of the page. The bars, having been rolled until they are about six inches wide by eighteen or twenty feet long, and something less than half an inch thick, are passed between rollers with interlocking sharp edged ridges and grooves, by which the metal is cut into rough square rods. One end of each rod is then made slightly smaller, so that it may be put through a hole of the size to which the whole rod is to be drawn down. The draw plate is a thick plate of the finest steel, perforated with holes of the various sizes from that of the largest to the smallest wire required. The holes differ from each other by almost imperceptible gradations, and they are tapering or slightly conical in form. The end of the rod of metal, having been put through one of these holes, is seized by pincers operated by machinery, and pulled through far enough to be made fast to an iron cylinder or upright roller, turned by power from the main shafting. The wire is in this way drawn through a series of smaller and smaller holes until it is reduced to the required degree of fineness, the wire being coiled up on the roller as it is drawn out. What is known as the "old English gauge" is the one by which wire is generally sold, while sheet metal is usually graded according to the "American" scale. In the latter the sizes run smaller in most of the numbers than in the former. The sizes of the "American" scale are graded on a uniform variation from No. 0000, which is 0·46 of an inch in diameter, to No. 40, which is 0·003444 of an inch thick. Other sizes than these are made to order when required.

The large view on this page, showing where tin, brass, and copper tubing is made, illustrates an important branch of the business done at Waterbury. Seamless tubes are now being much more generally used than they formerly were, and their greater strength and durability are obvious. In the other kinds of tubes the sheet metal is cut into strips of the required width and passed through formers, which fold the metal over so the edges are just ready to make a joint, and then a seam is brazed. For the seamless tubing the metal is cast in the form of a cylinder, about five feet long, with a core, so as to leave an inside diameter of about four inches. These hollow cylinders are then put through one drawing machine after another till they are drawn down to the required size, a steel arbor forming the inside of the tube as the draw plate shapes and finishes the outside. For beaded and ornamented tubing, round, square, octagon, etc., the metal is passed through draws of the required shape, and in which the pattern is cut in wheels to act as dies. A great many boiler tubes are drawn at this establishment, but the work includes every variety known to the trade, from tubes having a 4½ inch inside diameter down to those of small wire with an inside aperture which the finest thread would fill.



BENEDICT & BURNHAM MANUFACTURING COMPANY.—BRASS MANUFACTURE.

The principal productions of the Benedict & Burnham Company are sheet and roll metal, and brass, copper, and German silver wire and tubing, but they make beyond this a great variety of other work. A large department is devoted to the manufacture of kerosene lamp fixtures, and here nearly all the work is done by punching and drawing presses. In this line of goods they export large quantities to every part of the globe. The establishment has, at different times, executed many large orders for the government. They regularly turn out rivets and burrs, chains, butts and hinges, drop handles and knobs, escutcheons and ornaments, etc., and have, since January 1, been making about 500 watches a day. This is a comparatively new branch of business with them, but their watch is made to sell at a very low price, and has met with so large a demand that they are now constructing additional machinery to enable them to greatly increase their production.

The State of Connecticut has been for many years "headquarters" in the brass manufacture, and the Benedict & Burnham Manufacturing Company dates from the very commencement of the business. The house was established in 1812 by Aaron Benedict, father of Mr. Charles Benedict, the present head of the company. In 1824 Mr. Benedict introduced the first machines ever used in this country for rolling brass; they were imported from England, the rollers being 11 inches in diameter by 30 inches long, and elicited no little comment at the time. With the aid of this machinery they were able at once to commence supplying all brass workers with sheet brass, and their business grew rapidly. In 1835 they began rolling German silver, to be manufactured into spoons, forks, etc., and from

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that time to this their field of operations has been steadily enlarged. They now employ over 600 hands, and their buildings cover about six acres of ground. They have one 400 horse power engine, and two water wheels; for one of the latter they obtain the water from the Mad river, and for the other from the Naugatuck, their works being beautifully situated along the left bank of the latter, just below the entrance of the Mad. The present company was incorporated in 1843; but even the extensive business which it conducts hardly tells the full story of its success, for the company or its members have at different times started several other manufacturing industries, which are properly only offshoots, as it were, of the parent business, but which have now grown to be of large dimensions.

The company have stores at 78 Reade street, New York; 57 Oliver street, Boston, and 17 North Seventh street, Philadelphia. Mr. Charles Benedict is President and Treasurer of the company, and Mr. Charles Dickinson, Secretary.

A NOVEL SHADING PEN.

The annexed engraving represents a new instrument for plain and ornamental lettering, and is adapted to the use of bookkeepers, artists, markers, clerks, and penmen generally. The manipulation of the pen being purely mechanical and automatic, any person writing an ordinary hand can use it successfully and with satisfactory results. Its use familiarizes the eye with uniform design, so that the regular hand writing is rapidly improved. Shaded letters may be produced as readily as the plainest, and of such quality as to compare favorably with steel engraving or lithographic work. Several widths of this pen are made—one eighth, three sixteenths, and one fourth—each of which will make any width of line, from that of a hair line to the full width of the pen. They are made entirely plain throughout their entire width, or arranged to shade one side of the line produced according to the taste of the writer.

STOAKES' AUTOMATIC SHADING PEN.

These pens are inexpensive and must prove very useful in nearly every branch of business. Bookkeepers, with slight practice, can make ledger headings so uniform and artistic in appearance as to be quite beyond the comprehension of persons unfamiliar with the simple manner of their production. Any kind of ink may be used. The inventor informs us that more than seventy distinct and brilliant shades of color may be produced with the several colored inks adapted to this pen and in common use. The construction of the pen will be understood from the engravings, the larger view showing the pen in actual use, the smaller views showing the different sizes of pen.

Further particulars in regard to this useful invention may be obtained by addressing the patentee, Mr. J. W. Stoakes, Milan, Erie County, Ohio.

NEW WALL TENT AND STOVE.

A stove is often a necessity and always a desirable comfort in camp; for even in mid-summer there are chilly mornings and evenings and rainy days, when the comfort of a little heat in the tent is greatly to be desired. All who have had experience in camping know that the proverbially unmanageable stovepipe is most unmanageable in a tent. After ripping a hole in the tent, and getting the stovepipe in place, it is no uncommon experience to replace it again and again, after the wind has detached it from the stove and caused it to tumble; and should the pipe be permanently attached to the stove, the matter is made even worse, as not only the pipe but the stove also must sooner or later come down. These difficulties are not by any means all that can be brought as objections to the ordinary camp stove and its accessories. It is a cumbersome addition to the equipage, and takes up a great deal of valuable room in a tent where there is very little room to spare.

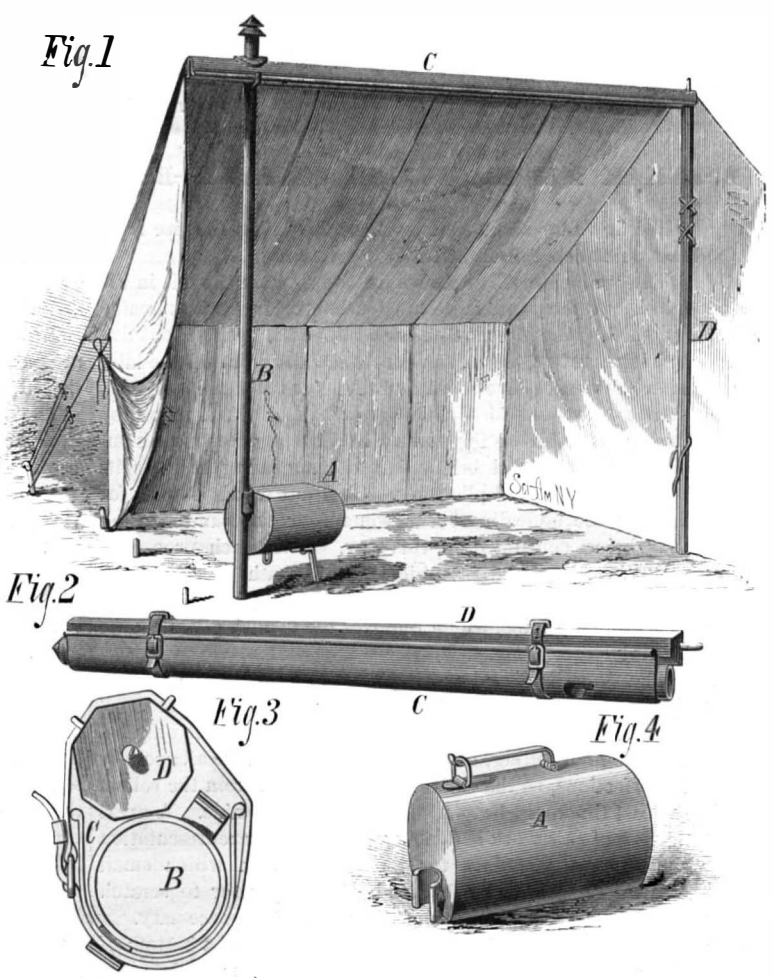
The Hobbs tent frame and stove overcome the difficulties enumerated, and afford a compact, light, and efficient cooking and heating apparatus, well adapted to the wants of military men, sportsmen, surveyors, and engineers, for camp meetings, pleasure camps, and for all who dwell in tents during a portion of the year. It is particularly well fitted for cooking, and its application to kitchen tents will not be among the least valuable of its uses.

The invention consists in substituting for the ordinary tent poles a frame composed of a ridge and hollow upright of galvanized sheet iron, and a wooden pole of the ordinary form.

The hollow upright, forming the stovepipe as well as one of the supports of the tent, is of a special patented construction, securing great strength and rigidity, and at the same time being very light. It sets in from the end of the tent a sufficient distance to prevent injuring the canvas by heating, and its upper end is provided with a chimney cap or cowl, which projects over the canvas. Near the lower extremity of the hollow upright a stove is attached in such a way that it accompanies the tent in all its swaying motions. The stove is supported by the upright and a single hinged leg, and is readily and easily placed and as readily detached and put aside when not in use.

Referring to the engraving, A is the stove which is attached to the vertical pipe, B, and the latter extends upward through the hollow ridge, C. The other end of the ridge is supported by the pole, D. The frame folds compactly together, as shown in the perspective view, Fig. 2, and transverse section, Fig. 4, and is secured by means of straps attached to the wooden pole, D. The chimney cap is carried in the stove, and the leg of the stove is converted into a handle, as shown in Fig. 3.

It will be seen that nothing is added to the bulk of the tent fixtures, but the stove, and the frame is more compact and portable than the ordinary poles. This useful invention has been covered by two patents by Capt. Charles W. Hobbs, of the U. S. Army. Mr. William A. Percy, of Plattsburg, Clinton county, N. Y., is agent and manufacturer. The inventor may be addressed in care of Mr. Percy.



HOBBS' WALL TENT AND STOVE.

MISCELLANEOUS INVENTIONS.

Mr. Joseph Kintz, of West Meriden, Conn., has patented an improved process for giving an ornamental surface or finish to iron castings, which process is as follows: The casting is first rolled or tumbled in the usual manner, and polished on the portions of the surface that are to have a polish on the finished article, and then the casting is coated with copper or other metal by electroplating. It is next subjected to acid bath, for cleaning, and then buffed to render the surface smooth and bright. It is then boiled in a tin or other metallic solution. The solution will deposit evenly over the entire surface, and the polished portions will be left brilliant, thereby forming a fine contrast with the unpolished surface and giving a fine polish and effect. The polishing previous to the electroplating, and the buffing subsequent thereto, are essential steps in the process, and by the boiling in a metallic solution the desired color and a bright clean finish are obtained without further labor.

An improvement in the class of automatic car couplings in which a bar is employed as the connecting device in place of the link, and is made to engage with spring jaws or catches located within the draw heads, such jaws or catches being operated by levers and connecting rods for the purpose of withdrawing them from engagement with the bar when it is desired to uncouple, has been patented by Mr. James H. Henley, of Leadville, Col.

A simple, convenient, and effective device for stretching wires along posts in the making wire fences, has been patented by Mr. Joshua Fowle, of Iowa City, Iowa. The invention consists of a clamp provided with devices for adjusting and holding it upon a post, and provided also with crank and crankshaft for stretching and tightening the wire.

An improvement in the class of invalid beds having adaptation and attachments for elevation of the head and shoulder portion, and for introduction of a bed pan beneath a removable section of the mattress, has been patented by Mr. Chambers M. Campbell, of Nashville, O.

An improvement in the class of ironing machines in which the clothes or goods to be pressed are carried between heated rollers or plates by means of endless traveling aprons, has been patented by Mr. Morris Steinbock, of New York city.

A simple, durable, and easily actuated alarm attachment for doors has been patented by Mr. Charles F. West, of Philadelphia, Pa. The invention consists of a peculiar arrangement of lever, striker, and trigger that render the alarm especially durable and of easy operation.

A safety appliance for releasing horses has been patented by Mr. Benjamin F. Strange, of Corvallis, Montana Ter. This invention consists in a hitching appliance so connected with the horse's halter that the halter will be cut if the animal should become entangled in it.

Mr. Mortimer Shea, of Nashville, Tenn., has patented an improved device for attachment to gas meters, to guard against any adjustment of the meter that will cause gas to pass through without being registered, and to indicate to the inspector if there has been any attempt to tamper with the meter.

An improvement in window sashes, patented by Mr. Alphonse Friedrick, of Brooklyn, N. Y., relates to lead sashes, such as are used in illuminated or ornamental windows. As heretofore constructed such windows have been strengthened by iron rods placed at intervals diagonally across the lead frames, and secured thereto by small wires twisted around the bars and soldered to the lead cross strips. Such bars are unsightly. They disfigure the designs, and in large windows the lead sash between the bars is not protected. The object of this invention is to strengthen the lead sashes where required by metal wires, which will be soldered to and hid by the sash.

An improvement in cannon has been patented by Messrs. Patrick P. Brannon and Thomas B. Bunting, of New York city. The invention relates to improvements in breech-loading cannon, and particularly to the construction of the breech, the breech block or wedge, and the manner of loading and firing the gun.

A simple device for stretching carpets on the floor, patented by Mr. John B. Eddy, of Stevens Point, Wis., consists of a T-head, with claws for taking hold of the carpet, attached to a ratchet bar spliced to another bar carrying a lever, with which the first bar is moved out from the other, and a pawl or dog which engages the ratchet and retains the bar in the position into which it is moved by the lever.

A wash bench susceptible of being raised in height and of being compactly folded has been patented by Mr. Abram Severson, of Auburn, N. Y. It consists of a tripod, two of the legs whereof are fixed to the head and provided with casters, while the third is pivoted in the head and can be folded around near the other two.

Mr. John A. Hollem, of New York city, has invented an improved trap for catching rats, mice, gophers, and other animals, which is so constructed as to catch an unlimited number of animals in succession. It is simple in construction and convenient in use.

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NEST-BUILDING FISH, GASTEROSTEIDÆ.

A. W. ROBERTS.

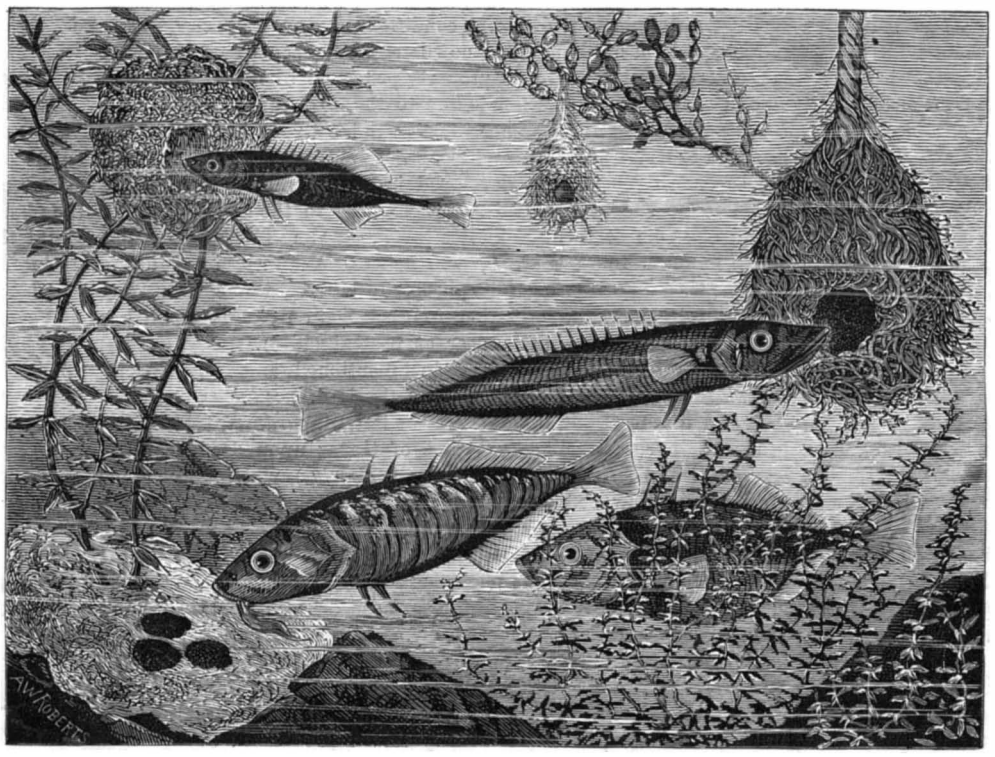
There is nothing more repulsive than exaggeration in natural history. Surely the phenomena themselves are wonderful enough for the healthy mind if properly set forth. Readers and students are not drawn to the study of nature by such means; indeed, the overdrawn statements, or the classifying of odd and unusual facts, as if of ordinary and regular character, will soon repel the earnest seeker for knowledge, and even the searcher for wholesome entertainment.

The nest-building stickleback is a good subject for this kind of pseudo-science. Sticklebacks *are* wonderful fish, and with them many wonderful things are possible. I know of no other fish that harmonize their colors to the surroundings as do the sticklebacks. Take the many-spined stickleback as an example. In a pond at Maspeth, L. I., which has a bottom of white clay, and was so situated as to be under the full glare of sunlight nearly all day, the color of the sticklebacks was that of a dirty white. A half a mile beyond this pond was a ditch containing peaty water; here the same variety of sticklebacks were brown. A few yards beyond this ditch was a hole, the bottom of which was black creek mud; here the sticklebacks were jet black, even to their eyes. The male fish of the varieties *Gasterosteus biaculeatus* and *aculeatus*, are more wonderful still, as illustrations of this fact. The first indication that a male stickleback, of either of the above named varieties, is about to construct a nest is the taking on of green and red colors, the eye at the same time becoming blue. When the nest is completed, and the time has come to either coax or drive the female to deposit her ova in the nest, then the colors of the male become wonderfully intense, the red becoming almost luminous. The male retains these colors till he abandons the young sticklebacks to shift for themselves.

In nature the male stickleback always selects material for his nest that is in keeping and harmony with the surroundings. This is a wise precaution for masking the contents of the nest from other fish, particularly sticklebacks, who are very fond of their own ova. In the engraving, at lower left-hand corner, a male of the three-spined stickleback (*Gasterosteus biaculeatus*) is shown carrying in his mouth material for the nest, while Mrs. Stickleback, heavy with ova, waits behind the plants for the completion of the nest.

The following description of how a sticklebackery was established is taken from the "Young Scientist." I know it to be truthful in every particular:

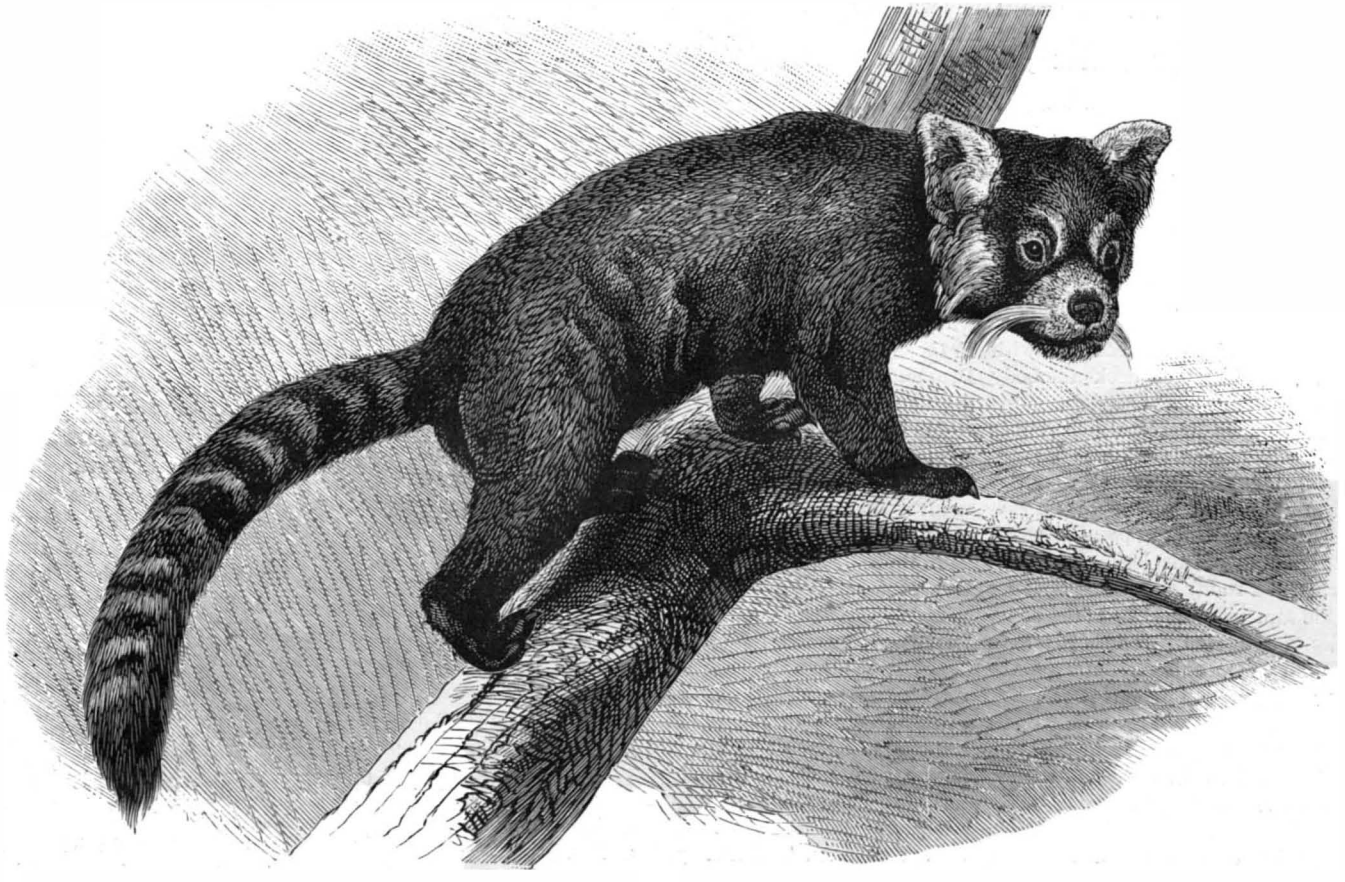
"Up in the hayloft was a box of window glass; taking a number of panes of glass, I formed in a washtub a series of compartments, in the following manner: From the center of the tub the panes of glass radiated till they came in close contact with the sides of the tub, thus forming a series of acute angles; the bottom edges of the glass were then crowded down through the three inches of sand till they rested on the bottom of the tub. In the apexes of the angles bunches of mermaid weed were planted; this also helped to sustain the glass compartments, as well as to keep up a thorough oxygenation of the water. In each compartment I placed a pair of sticklebacks, giving them a meal of angle worms before leaving them for the night. Next morning, when I examined the tub, to my great surprise, many nests had been built during the night; in some of them the bright yellow eggs showed plainly through the openings of the nest. Every nest was being vigorously ventilated by the male fish, who were hard at work fanning a current of water on them with their pectoral fins. In one compartment a male fish was tearing off small pieces of confervæ that grew on the mermaid weed, which he carried in his mouth to the nest, packing it down with his nose. After placing several mouthfuls in this way, he fastened the pieces together more compactly by pressing them down with the underside of his body, at the same time exuding a marine glue, so to speak, that cemented all together securely. In the center and on the top of each nest were four orifices, and into these the male, after a considerable display of anger and much labor, at last drove the female, her head projecting far enough out to allow her to breathe. In a few minutes the male drove her out of the nest head first, he now passing through the nest and over the eggs, just to see if Mrs. Stickleback had laid her eggs in the proper place, and to make things all right. In an instant he was out, flaring all over with blue, green, and orange, his eyes looking like small turquoises. When the openings of the nest became too large, he contracted them by patching on more confervæ. Over the nest he remained day and night, changing from one opening to another, constantly fanning a current of water through them. Whenever poor Mrs. Stickleback showed herself, her mate drove at her fiercely, biting her till she was glad to hide in the mermaid weed. The trouble was that she would have eaten all the eggs if she had had a chance, and he knew it. For this reason I took all the females out as soon as they had deposited their eggs. As each nest was completed and the eggs deposited, I withdrew the glass partitions; but terrible battles taking place between the males, I had to replace them. Even then they would try to fight each other through the glass. When all the eggs were hatched, and the bottom of each compartment seemed alive with young sticklebacks, I removed all the male fish and glass partitions, and in a few weeks was the happy possessor of a large school of inquisitive, restless baby sticklebacks."



NEST-BUILDING FISH, GASTEROSTEIDÆ.

The many-spined stickleback (*Gasterosteus occidentalis*) is called by dealers the "nine-spined" stickleback. At the upper left hand corner of the engraving is shown the nest and male of this variety. It is very seldom that the many-spined build when in confinement; I have known of only one instance, which occurred when connected with the aquaria at Barnum's (old) Museum. Unfortunately the nest was torn to pieces by a number of small eels before the eggs had hatched. The drawing here presented was made from a sketch I made of the nest as soon as it was completed. This nest was constructed in the branches of a mass of *Ludwigii*, and was composed of small fragments of dead aquatic plants and confervæ. The fibrous structure of the confervæ, and the thready consistency of the glutinous excretion of the male, had been utilized for securely binding the nest to the branches of the *Ludwigii*. The male of this variety becomes black during the season of incubation. I have known this variety of stickleback to ascend small fresh water streams of Long Island, many miles above the brackish water, and remain there for several seasons before returning to the ocean. The largest sized specimen I have ever taken of this variety was two and a half inches long, which is very unusual. When a number of these nine-spiners are placed in an aquarium they are very apt to school and boss everything in the tank.

To the right-hand side of the engraving is a representation of the fifteen-spined stickleback (*Gasterosteus spinachia*) and nest. This fish is a native of England. He is a long-bodied, long-snouted fish. On certain parts of the English coast these fifteen-spiners have at times swarmed the coast in such vast quantities that they were used for manuring the land. The nests (says the "Naturalist's Library") of the fifteen-spined stickleback are about eight inches in length and pear-shaped, formed of branches of common fucus and various corallines. These are all bound together in one confused compact mass, by means of a thread run through and round in every conceivable direction. This thread is of great length, and as fine as ordinary silk, and somewhat elastic, whitish, and formed of some albuminous secretion. The eggs are laid in the middle of the nest, in several irregular masses of about an inch in diameter, each consisting of many hundred ova, which are of the size of ordinary shot, and of a whitish or amber color. It would appear that the fish must first deposit its spawn amid the growing fucus, and afterwards gather its branches together round the eggs, at the same time weaving and incorporating all the rubbish that is lying or floating round the nucleus. Mr. Couch mentions a case where a pair of fifteen-spined sticklebacks made their nest in the loose end of a rope, and from which the separated strands hung out about a yard from the surface, over a depth of four or five fathoms, and to which the materials could only be brought, of course, in the mouth of the fish, from the distance of about thirty feet. The nest was formed of the usual aggregation of the finer sorts of the red and green seaweeds, but were so matted together in the hollow formed by the untwined strands of the rope, that the mass constituted an oblong ball of nearly the size of the fish, in which had been deposited the scattered assemblage of spawn. This was bound into shape with a thread



PANDA OR WAH.—[See next page.]

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of animal substance, which was passed through and through in various directions, while the rope formed an outside covering to the whole. A picture of this nest is shown in the illustration.

On our neighboring coast are several varieties of sticklebacks. The two best varieties as nest builders are *Gasterosteus biaculeatus* and *G. aculeatus*. They are distinguished by the two prominent spines on the back and a smaller spine just in front of the dorsal fin. The size of these varieties varies from two and a half inches to three inches. The body is covered on each side with a series of narrow vertical plates. The general color of these varieties is olive green on the back and that of oxidized silver on the sides.

These fish reach our coast in schools from the ocean during the early part of March. This year they were taken by collectors as early as February. I have seen the margins of ditches of brackish water on Long Island fairly alive with both sticklebacks and sheepshead lebias that had been deposited there by the spring tides. The sticklebacks and lebias were nesting side by side in perfect harmony.

Some years ago I knew of a pond of water that had become land locked from the tide that had flowed into it from Wallabout Bay. In this pond were hundreds of three-spined sticklebacks, whose habits had undergone a complete change, viz., five and oftentimes as many as ten females had spawned in one nest, the male fish in attendance always increasing the size of the nest to cover the extra deposits of ova, and at the same time taking entire charge of all the masses of eggs. These sticklebacks had become very much dwarfed. Both in nature and in artificial confinement the male stickleback always selects for the situation of the nest a sunny spot. A good illustration of this fact was that of a stickleback that had nested in a self-supporting tank, which was so situated that the sun shone on it for only half an hour each day, and that in a far off corner from where the nest was situated. So anxious was the male fish to obtain the benefit of this sunlight that every day he carried the mass of eggs in his mouth and placed them on the branches of an aquatic plant, where the sun's rays were strongest, after which he replaced them in the nest.

At one time I had a tank of sticklebacks at Barnum's, the bottom of which consisted of plain sand. In this tank were a large number of ripe sticklebacks, but not a particle of nesting material. One morning, greatly to my surprise, I noticed in each of the lower corners of the tank a male in full color hovering over masses of brownish material, with that peculiar vibratory motion of the male stickleback when ventilating the eggs. On taking out one of the masses I discovered it to be composed of fine-cut chewing tobacco.

I have often placed obstructions on the nest of a stickleback during its formation, the male always removing them when not too heavy to carry in his mouth. The male when building constantly tests the specific gravity of the materials selected. He having selected what appears to be a suitable fiber, he carries it a little way, then projects it from his mouth a short distance, and watches it fall; if it falls rapidly it is taken, if slowly it is rejected. When the young sticklebacks wander too far from the nest the male takes them in his mouth and deposits them near the nest. The eggs of the stickleback at first are of a light yellow color, but as they approach maturity they become darker; in course of time minute black spots appear, which are the eyes of the young fish inside of the eggs. The eggs of stickleback can be hatched very easily, by placing them in slightly running water, or by changing the water twice a day. The young fish are apt to die unless they are placed in water containing large quantities of animalcula, which they devour in large quantities. For this reason, as soon as the umbilical sack is absorbed they should be placed in a tub, or other vessel wherein the water has been under the influence of sunlight and the action of plants for some weeks, thus securing an abundant supply of natural food.

The best places to collect sticklebacks in the vicinity of New York is in the standing ditches on Long Island; also at the rear of Gunther's Railroad Station at Coney Island. The ditches back of the railroad station at Canarsie generally contain hundreds of sticklebacks in the months of March, April, and May.

THE PANDA, OR WAH.

There are few of the mammalia which are decorated with such refulgently beautiful fur as that which decks the body of the wah or panda, as it is also called.

This beautiful creature is a native of Nepal, where it is known under the different names of panda, chitwa, and wah —the last mentioned name being given to it on account of its peculiar cry. The fur of the panda is of a bright rich chestnut-brown, which rapidly darkens into a peculiarly rich black upon the ribs and the outside of the legs. The head is of a whitish-fawn color, with a ruddy chestnut spot under each eye. The tail is of the same chestnut hue as the body, and is marked with a series of dark rings. The head is very short and thick muzzled, presenting a curious contrast to the coaitis and racoons. See engraving on previous page.

It is generally found among the trees that grow near rivers and mountain torrents, but does not seem to occur in sufficient numbers to render its beautiful fur an object of commercial value. This is the more to be regretted, as the coat of the panda is not only handsome in appearance, but is very thick, fine, and warm in texture, being composed of a double set of hairs, the one forming a thick woolly covering to the skin, and the other composed of long glistening hairs that pierce through the wool and give the exquisitely rich coloring to the surface of the fur. The soles of the feet are not merely defended by nailed and thickened cuticles, but are furnished with a heavy covering of woolly hair, which in some species is of a light gray color, and in others of a snowy white, that contrasts strangely with the deep rich black of the legs and paws.

The food of the panda is usually of an animal character, and consists chiefly of birds, their eggs, and the smaller mammalia and insects, many of which it discovers on the trees whereon it is generally found.

Luminous Fungi.

There are no phenomena associated with fungi that are of greater interest than those which relate to luminosity. The fact that these plants under some conditions give out a phosphorescent light has long been known; and every school-boy is familiar with the luminous property possessed by rotting wood ("fox-fire"), and which is due to the mycelium of a fungus pervading its substance. This luminosity of fungi has been observed in various parts of the world, and where the species has been fully developed it has generally been found to be one of the toadstools belonging to the genus *Agaricus*. One of the best known species is the *Agaricus olearius* of Southern Europe, which was examined by Tulasne with especial view to its phosphorescence. In his introductory remarks, he says that four species only of the Agarics that are luminous appear at present (1848) to be known. One of them is the species just mentioned, another, *A. igneus*, comes from Amboyna; the third, *A. noctilucus*, has been discovered at Manila; and the last, *A. gardneri*, is produced in the Brazilian province of Goyaz upon dead leaves. The Agaric of the olive tree (*A. olearius*), which is itself very yellow, reflects a strong brilliant light, and remains endowed with this remarkable property while it grows, or, at least, while it appears to preserve an active life and remains fresh. The phosphorescence is at first, and more ordinarily, recognizable at the surface of the gills; but in many cases, and among more aged fungi, the gills cease to give out light, and the stipe throws out a brilliant glare. Tulasne, who examined this subject very carefully, infers from his experiments that the same agents—oxygen, water, and warmth—are perfectly necessary to the production of phosphorescence as much in living organized beings as in those which have ceased to live. In either case, the luminous phenomena accompany a chemical reaction, which consists principally in a combination of the organized matter with the oxygen of the air; that is to say, in its combustion, and in the discharge of carbonic acid which thus shows itself. Mr. Gardner has graphically described his first acquaintance in Brazil with the phosphorescent species which now bears his name (*A. gardneri*). It was encountered on a dark December night, while he was passing through the streets of Villa de Natividate. Some boys were amusing themselves with a luminous object, which at first he supposed to be a large fire-fly, but on making inquiry he found it to be a beautiful phosphorescent toadstool, which, he was told, grew abundantly in the neighborhood on the decaying leaves of a dwarf palm. The whole plant gives out at night a bright light somewhat similar to that emitted by the larger fire-flies, having a pale greenish hue. From this circumstance, and from growing in a palm, it was called by the inhabitants "Flor de Coco." The number of recognized luminous species of *Agaricus* is not large, though three or four others may be enumerated in addition to those already cited. Of these, *A. lampas*, and some others, are found in Australia; and Dr. Hooker speaks of the phenomena as common in Sikkim, but he was never able to ascertain with what species it was associated. As regards Australian species, interesting information is given in regard to two by Mr. James Drummond, in a letter from Swan River. These grew on stumps of trees, and had nothing remarkable in their appearance by day, but by night emitted a most curious light, such as he had never seen described in any book. One species was found growing on the stump of a *Banksia*, which was surrounded by water. It was on a dark night, when passing, that the curious light was first observed. When the fungus was laid upon a newspaper, it emitted by night a phosphorescent light, enabling persons to read the words around it, and it continued to do so for several nights with gradually increasing intensity as the plant dried up. In the other instance, which occurred some years after, Mr. Drummond, during one of his botanical trips, was struck by the appearance of a large toadstool, measuring sixteen inches in diameter, and weighing about five pounds. This specimen was hung up to dry in the sitting-room, and on passing through the apartment in the dark it was observed to give out the same remarkable light. The luminous property only ceased when the plant became dry.

In the current number of the *Gardener's Chronicle*, the Rev. M. J. Berkeley describes still another species, new to science, recently received by him from the Andaman Islands, and which, though small in size, exceeds in brilliancy any species that has hitherto been observed. In this species, which Mr. Berkeley names *Agaricus emerici*, the entire substance of the fungus is described as being most brilliantly luminous. There are a few other fungi belonging to genera other than *Agaricus*, which have been observed to be luminous under certain conditions; *Thelephora phosphorea* and *Polyporus sulfureus*, for example, the latter being a common American species. In all the cases of phosphorescence recorded as occurring in these cryptogamic plants, the light emitted is described as of the same character, varying only in intensity. It answers well to the name applied to it, as it seems remarkably similar to the light emitted by some living insects and other animal organisms, as well as to that evolved, under favorable conditions, by dead animal matter—a pale, bluish light, resembling that emitted by phosphorus as seen in a dark room.

A New Fiber.

In the Paris Exhibition was shown a sample of a fiber named *Malachra rotundifolia*, sent from Bombay. This plant is, however, only found in South America—at least so says Dr. King, to whom the supposed *Malachra rotundifolia* was sent for identification, and he states that it is *Malachra capitata*, not *Malachra rotundifolia*. As a fiber, be it what may, it undoubtedly deserves attention, for it is said to be quite equal to jute. The following is the description given of it: "The fiber is in length from eight feet to nine feet, has a silvery appearance, with a peculiar luster, and is almost as soft as silk. In passing the fiber through the machinery damped with oil and water, as is commonly done with Bengal and Koukan jute, yarn was produced strong enough and nearly equal to that made from the second quality of Bengal jute. If the plant is carefully grown and well looked after, the fiber would then no doubt rank fully equal to Bengal and Bombay jute. Owing to the high prices ruling for jute in Bengal and elsewhere, the new fiber, if carefully prepared, would command a ready sale at 3·12 rupees to 4 rupees per Indian maund." There appears to be no difficulty in growing this plant, which belongs to the natural order of *Malvaceæ*, in Bengal, marshy places within the tropics being considered favorable to its growth, and there is, therefore, every reason why a fair trial should be made of its apparently valuable properties. The fiber is prepared in precisely the same way as jute, but requires to be steeped directly it is cut, as exposure to the sun dries and hardens the stems, preventing the easy removal of the bark from them, and rendering the fiber itself coarser in quality than it would otherwise be.

Human Filariæ and Mosquitoes.

The new investigations of Dr. Manson, communicated to the Quekett Club recently, appear to afford positive proof of a singular habit on the part of the filariæ. These microscopic worms periodically pass in and out of the circulation. Dr. Manson gives a table showing the hours of the day and night at which they are either present or absent in the blood. The worms are remarkably punctual in keeping to their appointed times. The evening inrush to the circulation commences about half-past seven, the over-crowding attaining its maximum at midnight. Into the clinical bearings of the subject it will be time to enter when the remarkable evidence brought forward by Dr. Manson has been fully published in the "Transactions" of the Club. In addition to some introductory remarks by himself, the President read brief communications on the subject of filariæ from Drs. Somerville, Mortimer-Granville, J. Bancroft, J. L. Paterson of Bahia, and others. The meeting was well attended, and in the course of the discussion which followed, Dr. Stephen Mackenzie stated that he had at present under his care, in the London Hospital, a patient from Calcutta, with chyluria. Although Dr. Lewis had found filariæ in the blood of this man in India, Dr. Mackenzie's efforts to find the filariæ had at present been unattended with success. The interest of the various papers was much increased by the exhibition of drawings and specimens of the filariæ in all the stages of growth hitherto observed. Numerous infested mosquitoes were also shown.—*Lancet.*

New Observations concerning Bees.

Mr. E. A. Thompson writes to the *American Naturalist* that certain moths, *Plusia precationis*, having been caught by their tongues in the pollen-pockets of *Physianthus albens*, an Asclepiad plant, were stung to death and devoured by what were supposed to be ordinary honey-bees. Dr. Hermann Müller considers the fact of the moths being thus entrapped new and interesting; but mentions that his brother, Fritz Müller, in South Brazil, has observed bees eagerly licking the juice dropping from pieces of flesh which had been suspended to dry in the air. Mr. Darwin suggests that the bees may possibly tear open the bodies of the moths in order to get at the nectar contained in their stomachs. Both these distinguished naturalists recommend further observation. It is stated by Prof. A. J. Cook, of the Michigan Agricultural College, that bees kill the drones not by stinging, but by tearing with the mandibles.

Causes of Fatigue in Reading.

An important study has been made of this subject by Dr. Javal, director of the Laboratory of Ophthalmology of the Sorbonne, published in the *Annales d'Oculistique*. The fatigue of the eyes which is so often complained of by literary men he believes due to a permanent tension of accommodation; reading requires constant, steady strain of the eyes, while many other occupations demanding close, do not need constant, sight. His researches extend to the question of great economical importance: Given a surface of paper and a number of words to print upon it, what rule will secure the maximum of legibility? The answer is: Other things being equal, the legibility of a printed page does not depend on the height of the letters, but on their breadth. This fact is of special importance in the preparation of school books, and Dr. Laval's suggestions should receive the attention of publishers, type founders, and school boards.

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Correspondence.

The Edison Lamp Tests.

To the Editor of the Scientific American:

I have read to-day with much interest the results of Messrs. Morton, Mayer, and Thomas's experiments with an Edison electric lamp, published in the SCIENTIFIC AMERICAN of April 17. The results obtained, so far as they relate to the resistances of the loop while giving lights of different intensities, and the current required for a light of fifteen candles, are valuable, but those given relative to the cost of one hundred and twenty candles are of *no* value, because it is (evidently) premised that the twelve lamps are to be in series in a single circuit, whereas, in Mr. Edison's proposed system, each one of the twelve lamps would be placed in a branch circuit by itself, or in other words, in multiple arc; and the cost then would be much less than the Stevens Institute experimenters' report. The resistance of the armature of Mr. Edison's generator is so small that it may be neglected entirely, without seriously affecting the value of calculations, and the resistances of the leading wires may also be made so small that their neglect will not make any appreciable difference. This being the case, let us see what would be the actual amount of coal required to maintain twelve electric lights in multiple arc, having a total intensity of one hundred and twenty candles.

Before entering upon this calculation, however, let us determine the electro-motive force required to supply a current of 0·905 weber, in a circuit of 76 ohms resistance. Multiplying the current by the resistance gives $0{\cdot}905 \times 76 = 68{\cdot}78$, which would be the required electro-motive force in volts. Now, then, place the twelve lamps of 76 ohms resistance each in multiple arc, and their joint resistance will be one twelfth part of that of a single lamp, or 6 1-3 ohms. As the current generated by the machine is to be divided among twelve branch circuits, so that each circuit will receive a current of 0·905 weber, it is obvious that the total current generated by the machine must be twelve times that required for a single circuit, or 10·860 webers. Multiplying the current by the resistance (as we did for the single lamp) gives $10{\cdot}860 \times 6\ 1\text{-}3 = 68{\cdot}78$, which is the required electro-motive force, in volts, and is exactly the same as that required for a single lamp. Hence, even with a Brush or Siemens machine, where forty per cent of the original energy is lost, the amount of coal required to operate twelve lamps giving an intensity of one hundred and twenty candles, is only five twelfths of one pound, instead of five pounds, as calculated by the aforesaid experimenters.

This shows a pretty large margin below the cost of producing a somewhat less light by coal gas, and in practice the margin would be still greater, for Mr. Edison's generator is said to transform considerably more than sixty per cent of the original energy into effective current.

Respectfully yours, WM. C. RAMSDELL.

Norwich, Conn., April 9, 1880.

AGRICULTURAL INVENTIONS.

A revolving hay rake, so constructed that the rake head may be raised to pass obstructions and miss hay without discharging the collected hay, may be conveniently adjusted with the teeth at any desired inclination, and may be readily tripped to discharge collected hay, has been patented by Mr. Jacob S. Oberholtzer, of Wadsworth, Ohio.

A spring harrow tooth, made in two parts, whose point is vertically adjustable in such a manner that it may be raised or lowered without altering its pitch or draught, and the tooth be thereby stiffened or made more flexible for deep or shallow work, has been patented by Mr. Perry A. Peer, of Comstock, Mich.

An improved sugar cane cutter, patented by Mr. Philip Seitz, of Baton Rouge, La., is an improvement on the machine for which letters patent No. 196,598 were granted to the same inventor, October 30, 1877.

An improved machine for removing bugs from potato vines, has been patented by Goodrich E. Risley, of Waterville, N. Y. The object of this invention is to furnish a new machine for removing bugs from potato vines and catching them, so that they may be readily destroyed.

Mr. John Hill, of Columbus, Ga., has invented a feed indicator for cotton openers. This invention relates to a convenient and certain means for determining the quantity of cotton to be fed to cotton openers. The latter machines are devices which serve to tear up and loosen the tussocks of cotton as they come from the bale and distribute the fiber in the form of a fleece. In using these openers two are sometimes employed together to act successively upon the cotton; or one opener may be employed in connection with a lapping machine, the function of which latter is to press together and compact into a fleece. In either case a hollow trunk has been employed as a conduit, in connection with a blast of air passing through the same, to act as a vehicle to carry the fleece from one opener to the other, or from the opener to the lapping machine, which second machine is generally located upon a different floor, or at a point more or less remote from the first. This invention has more special reference to what is known as "Kitson's Trunk System of Opening Cotton;" but it can be used in any similar system where the opener is located at some distance from the second opener or lapper, and cotton is supplied from the first to the second through a trunk or flue. The invention consists in making the boxes of the upper feed roll of the second opener or lapper vertically adjustable and connecting them with an index hand within sight of the operator at the first machine, so that the operator, at a point remote from the second machine, can tell the amount of cotton fed to the second machine by the rise or fall of the movable roller due to the passage of a greater or less quantity of cotton to the second machine.

The Comet as Seen in Australia.

The Melbourne *Argus* says: "The tail of a large comet was discovered in the southwestern heavens, near the horizon, on February 2, soon after sunset. The nucleus could not be seen either on the 2d or 3d, but about 25° length of tail were visible. The extremity of the tail on the 2d reached to β Gruis, and next night it had shifted considerably to the northward so as to pass close by θ Gruis. On the first night it made an angle of 50° with the horizon, and on the second 80°. Owing to the misty state of the air and the closeness of the comet to the sun, no favorable observations could be made in Melbourne on the first or second night."

The *Argus* of the 5th of February says: "Owing to the presence of clouds and a hazy sky no continuous observation of the comet could be made at the observatory last night. The best view of the visitor was obtained at 8:35 P.M., when it extended 32° above the horizon. Occasionally the sky cleared, so that a view could be obtained nearly down to the horizon, but the nucleus of the comet was not visible. The tail had slightly diminished in brightness from the previous evening, and was rather less curved. It appeared to be almost perpendicular to the horizon, and had moved slightly to the northward. Its length had considerably increased since Tuesday evening. Until the nucleus has been observed no knowledge can be obtained as to the direction in which the comet is traveling or its actual position in the heavens. It will probably be two or three weeks before any definite information on these points can be obtained. We have received the following telegram: 'Perth, February 4. A long stream of lustrous light, resembling the tail of an immense comet, is visible a little above the horizon in the western heavens. It appears to be making an easterly course.'"

Canadian Weather.

Mr. H. G. Vennor, of Montreal, whose boldness in weather predictions has brought him into such prominence, says that the extreme cold of Canada is almost always produced by a wind blowing from a point to the north of west. Such a wind is both cold and dry. Being dry, in passing along it imbibes moisture rapidly, causing cold. Being also cold, it quickly absorbs heat from the surface of the earth; and when this continues for several hours of any day, and toward sunset it becomes calm, we then usually have the lowest state of the thermometer. In Canada, these extremes of cold usually last about three days; the nor'wester beginning about noon of one day, blowing fiercely for that afternoon, becoming almost calm in the evening—then a cold night. Next day the wind is not so high, but still from a northwesterly point. Again, toward sunset, there is a calm, with the thermometer more or less below zero. In the morning, it may be observed that the force of the cold is breaking. If the wind veers round to a point south of west, there will be a few flurries of snow, very threatening in appearance, but amounting to very little in reality, no snow storms of consequence coming from the west. If, on the other hand, the wind passes to the east, several hours of bitter cold may be expected, followed by a general snow storm lasting from twenty to thirty hours.

Paper Clay.

In view of the rapid rise in the price of paper, and the complaints of the paper makers with regard to the scarcity and increasing costliness of all sorts of paper stock, it is gratifying to see that one source of such raw material is not likely soon to fail us. Whatever may happen to rags, wood pulp, and the thousand other sorts of fibrous material supposed to enter into the composition of paper, the clay bank promises to be inexhaustible. True, the majority of people who pay a high price for paper may have a prejudice against that material, but evidently the owners of the clay banks have not; for in a prominent journal devoted to the paper trade, they boldly print a large cut of their "clay works," showing a long stretch of snowy bluff out of which a huge section has been cut, presumably to supply the needs of "all first-class mills, east and west," to whose owners they refer for evidence of the excellence of their clay.

The American Society of Mechanical Engineers.

The organization of the American Society of Mechanical Engineers was completed April 7, at a numerously attended meeting in the hall of Stevens Institute, Hoboken. The society will embrace members, honorary members, associates, and juniors, and is open to mechanical, civil, military, naval, mining, and metallurgical engineers, and architects of practical attainments as designers, constructors, or teachers, if they apply for full membership. A junior must have been in practice for two years, or must be a graduate of an engineering school. The first regular annual meeting will be held in this city in November next. The election of officers resulted as follows: President, R. H. Thurston; Vice-Presidents: H. R. Worthington, Coleman Sellers, Eckley B. Coxe, General Q. A. Gillmore, U. S. A.; Wm. H. Shock, U. S. N.; Alex. L. Holley; Managers: W. P. Trowbridge, Theo. N. Ely, J. C. Hoadley, Washington Jones, Wm. B. Cogswell, F. A. Pratt, Chas. B. Richards, Wm. B. Bement, S. B. Whiting; Treasurer, Lycurgus B. Moore.

Blacksmith's Hammer Signals.

When the blacksmith gives the anvil quick light blows it is a signal to the helper to use the sledge, or to strike quicker.

The force of the blows given by the blacksmith's hammer indicates the force of the blow it is required to give the sledge.

The blacksmith's helper is supposed to strike the work in the middle of the width of the anvil, and when this requires to be varied the blacksmith indicates where the sledge blows are to fall by touching the required spot with his hand hammer.

If the sledge is required to have a lateral motion while descending, the blacksmith indicates the same to the helper by delivering hand hammer blows in which the hand hammer moves in the direction required for the sledge to move.

If the blacksmith delivers a heavy blow upon the work and an intermediate light blow upon the anvil, it denotes that heavy sledge blows are required.

If there are two or more helpers the blacksmith strikes a blow between each helper's sledge hammer blow, the object being to merely denote where the sledge blows are to fall.

When the blacksmith desires the sledge blows to cease, he lets the hand hammer head fall upon the anvil and continues its rebound upon the same until it ceases.

Thus the movements of the hand hammer constitute signals to the helper, and what appear desultory blows to the common observer, constitute the method of communication between the blacksmith and his helper.

Strawberries in South Carolina.

A Charleston newspaper notes a steady decline in the price of strawberries in South Carolina since they were first cultivated for northern markets. In 1872, they brought an average price of 57 cents a quart; in 1873, 33 cents; in 1874, 38 cents; in 1875, 29¼ cents; in 1876, 21 cents; in 1877, 20 cents; in 1878, 11⅛ cents; in 1879, 14 cents; and this year the average is estimated at about 12½ cents. The decline in price is, of course, easily traceable to the increase of the crop raised, and to the nominally lower price of all products due to the return of the currency to a specie basis. Taking the acreage this year at 225, and the average yield at 4,000 quarts to the acre, the yield will be 900,000 quarts, which at an average of 12½ cents a quart, will return an income of $112,500.

The Fish Hawk Finished.

The new steamer Fish Hawk, especially designed for the propagating work of the U. S. Fish Commission, is at last ready for work. She is a double screw steamer of about 600 tons, fitted up so as to be able to take the spawn of any variety of fish, and complete the hatching of the young fry in their native waters. This obviates the necessity of the long and expensive journeys with young fish which have entered so largely into the labors of the commission heretofore. Besides in the propagation of many species of fish, the floating hatchery is found to be much more successful and satisfactory than any establishment can be on shore.

The Brooklyn Bridge.

A new impetus has been given to the work on the Brooklyn bridge by the passage and signing of an appropriation bill at Albany, ordering the City of New York to pay $750,000, and the City of Brooklyn $1,500,000—total, $2,250,000, to enable the trustees to finish the work. The president of the Board of Trustees of the bridge reports that the speedy execution of the various contracts in connection with the superstructure will be insisted on, and that there is no reason to suppose that there will be any further delays. The removal of the remaining buildings in the way of the approaches to the bridge is going on, and the rapid execution of the rest of the great work is confidently promised.

The Vesuvius Railway.

Tourists are now able to visit the crater of Vesuvius without the labor of climbing, the railway being complete. The depot is situated at a height of 810 meters, or 210 meters above the Observatory. A restaurant and café capable of accommodating 100 people is attached to the depot. The angle of inclination of this railroad attains at various points 40°, 50°, and 63°. There are two passenger cars, the Vesuvius and Etna, accommodating 12 persons each. The system adopted in the construction of the railway is of American nvention, and is known as "the prismatic system."

Pioneer Paper-Makers.

Two veteran paper makers, Stephen Thacher and Joseph Reed, have lately passed away. Mr. Thacher was within a week of reaching his hundredth year. He built the first paper mill at Lee, Mass., thus laying the foundation of what has become the great industry of that town. Of late years he has resided at Saratoga Springs, N. Y. Mr. Reed was ninety years of age when he was killed on a railway near Springfield Station, Pa. He was poor as well as old, and apparently without near relatives. Personally, he was probably known to more paper-makers than any other man of the craft.

If an invention is worthless and it fails of public support, *no one suffers but the inventor.* If it is *good* and succeeds, the *whole world reaps* the benefit. The public, which pays nothing in the one instance and gains enormously in the other, is thus vitally interested in the encouragement of inventions and the upholding of our patent system.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

Lubricene, Gear Grease, Cylinder and Machinery Oils. R. J. Chard, 6 Burling Slip, New York.

OFFICE BIGELOW BLUE-STONE COMPANY, 247 BROADWAY, NEW YORK, April 8, 1880.

H. W. Johns M'f'g Co., 87 Maiden Lane, New York.

GENTS: Owing to the fire which occurred on the morning of February 1, at the works of our blue-stone and planing mills, situated at Malden, on the Hudson, we shall shortly require more of your roofing material, and would like quotations for same. That portion of the building covered with shingles was entirely consumed, but we take pleasure in stating that when the flames reached that part covered with your Asbestos Roofing the edges fell over that part of the roof and prevented further progress of the flames. The building would have been a total loss had it not been for your roofing.

You are at liberty to make any use you choose of this letter, and refer any one to us as to the merits of the Asbestos Roofing. Respectfully yours,

JOHN MAXWELL, Lessee.

G. W. Baker, Wil., Del., makes the Post Band Saw for hand, foot, and steam. Will cut 7 inches thick of hard wood.

For round text hand and for a pen to stand hard usage, try Esterbrook's Exquisite, No. 50. Ask your stationer for them.

Wanted—Situation by Draughtsman. Technical education; bridge work; general machinery or tools. Address A. B. C., Davis St., Elmira, N. Y.

Power, Foot, and Hand Presses for Metal Workers. Moderate prices. Peerless Punch and Shear Co., 52 Dey St., New York.

Valuable Patents for Sale or Lease on Royalty to good party. Address P. E. Bird, Jenkintown, Pa.

H. L. Perrine, Mech. Draughtsman, 6177th St., Washington, D. C. Drawings for inventors from sketches or models.

For Sale.—U. S. and Canadian Patent for a Blind Stitch Sewing Machine; a valuable invention. Address P. Hoffman, 197 East Genessee St., Buffalo, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for infomation. C. H. Brown & Co., sole manufacturers, Fitchburg, Mass.

Catalogue of Useful Books on Applied Science sent free. E. & F. N. Spon, 446 Broome St., New York.

Blake Lion and Eagle Imp'd Crusher. See adv. p. 236.

Foundry and Machine Shops for sale. Established in 1846. Write for description to E. J. Hoen, Addison, Steuben Co., N. Y.

Corrugated Traction Tire for Portable Engines, etc. Sole manufacturers, H. Lloyd, Son & Co., Pittsburg, Pa.

Spokes and Rims, white oak and hickory, best quality, to any pattern, and Hammer Handles of best hickory. John Fitz, Martinsburg, West Va.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

Collection of Ornaments.—A book containing over 1,000 different designs, such as crests, coats of arms, vignettes, scrolls, corners, borders, etc., sent on receipt of $2. Palm & Fechteler, 408 Broadway, New York city.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Sheet Metal Presses. Ferracute Co., Bridgeton, N. J.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Bradley's cushioned helve hammers. See illus. ad. p. 269.

Forsaith & Co., Manchester, N. H., & 213 Centre St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

Electrical Indicators for giving signal notice of extremes of pressure or temperature. Costs only $20. Attached to any instrument. T. Shaw, 915 Ridge Ave. Phila.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Portable Forges, $12. Roberts, 107 Liberty St., N. Y.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 238.

Peck's Patent Drop Press. See adv., page 236.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 252.

For Separators, Farm & Vertical Engines, see adv. p. 251.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 253.

For Patent Shapers and Planers, see ills. adv. p. 251.

For Alcott's Improved Turbine, see adv. p. 270.

Planing and Matching Machines, Band and Scroll Saws, Universal Wood-workers, Universal Hand Jointers, Shaping, Sand-papering Machines, etc., manf'd by Bentel, Margedant & Co., Hamilton, Ohio. "Illustrated History of Progress made in Wood-working Machinery," sent free.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 254.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien M'f'rs, 23d St., above Race, Phila., Pa.

Chase's Pipe Cutting & Threading Machine. Send for circular. Chase Machine Co., 120 Front St., New York.

Silent Injector, Blower, and Exhauster. See adv. p. 269.

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Large knife work a specialty. Also manufacturers of Soloman's Parallel Vise. Taylor, Stiles & Co., Riegelsville, N. J.

Horizontal Steam Engines and Boilers of best construction. Atlantic Steam Engine Works, Brooklyn, N. Y.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Brass & Copper in sheets, wire & blanks. See ad. p. 268.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For Superior Steam Heat. Appar., see adv., page 270.

The "Fitchburg" Automatic Cut-off Horizontal Engines. The "Haskins" Engines and Boilers. Send for pamphlet. Fitchburg Steam Engine Co., Fitchb'g, Mass.

We will purchase or manufacture on royalty, patented articles of real merit. Farley & Richards, Phila., Pa.

Millstone Dressing Machine. See adv., page 269.

Cut Gears for Models, etc. Models, working machinery, experimental work, manufacturing, etc., to order. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of last week.

The E. Horton & Son Co., Windsor Locks, Conn., manufacture the Sweetland Improved Horton Chuck.

The best Truss ever used. Send for descriptive circular to N. Y. Elastic Truss Co., 683 Broadway, New York.

Inventors' Institute, Cooper Union. A permanent exhibition of inventions. Prospectus on application. 733 Broadway, N. Y.

For Reliable Emery Wheels and Machines, address The Lehigh Valley Emery Wheel Co., Weissport, Pa.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 108.

Telephones.—Inventors of Improvements in Telephones and Telephonic Apparatus are requested to communicate with the Scottish Telephonic Exchange, Limited, 34 St. Andrew Square, Edinburgh, Scotland. J. G. Lorrain, General Manager.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Circulars on application. Pittsburg Steel Casting Company, Pittsburg, Pa.

New Economizer Portable Engine. See illus. adv. p. 269.

Cutters shaped entirely by machinery for cutting teeth of gear wheels. Pratt & Whitney Co., Hartford, Conn.

Catechism of the Locomotive, 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 269. Totten & Co., Pittsburg.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) H. L. R. writes: I have an upright tubular boiler, and it leaks around the tubes in the head. I have expanded the tubes several times, and they do not stay in their places. What can I do to make them stay? I thought that they could be fixed by putting a ferrule on the inside and then expand it. Would that do? A. Your trouble may arise from a deposit of sediment on the lower tube sheet or crown sheet of the furnace, or the tubes may be worn so thin that they cannot be made tight. Ferrules might help you, but they should be of cast iron and turned.

(2) H. & D. D. ask: 1. Can a common machinist make a phonograph that will repeat what has been spoken into it? If so, will you please tell us where we can get a description of one. We are both pretty fair hands with our tools, and we would like to make one. A. Yes. For directions see SUPPLEMENT 133. 2. Is there any way that we could make carbon? We have been experimenting with an electric light, and would like to try and make our own carbon points. A. You will find formulæ for electric light carbons in "The Electric Light," by Higgs; but we would not advise you to try to make them. It is far better and cheaper to purchase. 3. What part of a horse power is an engine with a cylinder 1 inch by 2 inches, and what size of boiler would it require to drive it, the piston making 26 strokes per minute, using 45 lb. of steam? A. If you mean 26 strokes, it is one-third horse power; if you mean 26 revolutions, two-thirds horse power. In the first case, 6 square feet heating surface in boiler, and in the last 12 square feet. 4. Are the two cylinders of a double acting engine equal to both added together: as, for example, take 11 inch by 20 inch hoisting engine. If we were to use a 22 inch by 40 inch single engine, would it give the same amount of horse power using same pounds steam in both cases? A. Yes; equal to one of 11 inch diameter by 40 inch; but a cylinder 22 inch by 40 inch is equal to four of 11 inch by 40 inch, or eight of 11 inch by 20 inch.

(3) W. J. N. asks: What makes the best polish to clean up and brighten old furniture, pianos, etc., and coffin varnished surfaces? A. Dissolve 4 oz. orange shellac in 1 quart of 95 per cent alcohol; to this add 1 quart of linseed oil and 1 pint of turpentine; when mixed add 4 oz. of sulphuric ether and 4 oz. of aqua ammonia, mix thoroughly and well before using. Apply with a cloth or sponge, and rub the surface to which it is applied until the polish appears.

(4) J. F. M. writes: To tighten a pipe box that has turned and worn the hub away so that it cannot be wedged· Center the box, secure it with three thin strips of wood, and pour melted sulphur around it. As the sulphur cools it expands and holds the box perfectly tight.

(5) J. A. M. writes: I notice quite a difference in the formulas you give in regard to the horse power of belting. Some time ago I took the formula as follows from your paper, of which I have many volumes: $\frac{\text{W. in inches} \times \text{S. in feet per minute}}{600} = \text{H P.}$

Then February 14 some belting establishment furnishes the following for a 6 inch belt

$$\frac{6 \times 4^3 \times 1200}{2 \times 33000} = \text{H. P.}$$

Then in the number for March 27, in answer to G. I. B., you say 800 feet inches = H. P. A. The formula $\frac{W \times S}{600} = \text{H. P.}$ is considered a good practical rule for belts of average width and length, and is used by many engineers. The formula $\frac{W\ S}{800} = \text{H. P.}$, is safer for narrow and short belts running on small pulleys. These formulæ are very simple, and meet the want of practice.

(6) O. asks: Can illuminating gas be made from water? If so, how? A. Yes; when superheated steam is passed slowly through a large body of ignited carbon (coal) it parts with its oxygen to the latter. The resulting gas—composed chiefly of hydrogen and carbon monoxide—has very little illuminating power, but this is remedied by introducing a small quantity of the vapor of some rich hydrocarbon—as naphtha—into the retort with the gases.

(7) G. M. T. asks for a recipe for a reliable shoe gloss. A. Shaw's patent blacking is made as follows: Soft water, 1 gallon; logwood extract, 6 oz.; dissolve by gentle heat; soft water, 1 gallon; borax, 6 oz.; shellac, 1½ oz.; boil until solution is effected; potassium dichromate, ¾ oz.; water, ½ pint; dissolve and add all together. It is preferred to add to this before boiling 3 oz. of spirit of ammonia or aqua ammonia.

(8) R. A. S. asks how to make a cement for uniting metals to glass. A. Take 1 lb. shellac dissolved in a pint of strong methylated spirit, to which is to be added 0·05 part of solution of India-rubber in carbon bisulphide; or take 2 ounces of a thick solution of glue, and mix with 1 ounce of linseed oil varnish, or ¾ of an ounce of Venice turpentine; boil together, and agitate. The pieces cemented should be fastened for 50 or 60 hours to get fixed.

(9) F. B. asks for a good waterproof cement. 1. Soak pure glue in water until it is soft; then dissolve it in the smallest possible amount of proof spirit by the aid of a gentle heat. In 2 oz. of this mixture dissolve 10 grains of gum ammoniacum, and while still liquid add half a drachm of mastic dissolved in 3 drachms of rectified spirit. Stir well, and for use keep the cement liquefied in a covered vessel over a hot water bath. 2. Shellac, 4 oz.; borax, 1 oz.; boil in a little water until dissolved, and concentrate by heat to a paste. 3. Ten parts of carbon disulphide and one part oil of turpentine are mixed, and as much gutta percha added as will readily dissolve. 4. Melt together equal parts of pitch and gutta percha, apply warm, and press the parts firmly together until quite cold. 5. The ordinary marine glue consists of caoutchouc, 1 oz.; genuine asphaltum, 2 oz.; benzole or naphtha, q. s. The caoutchouc is first dissolved by digestion and occasional agitation, and the asphalt gradually added. The solution should have about the consistence of molasses.

(10) A. H. writes: I have a driving or cog wheel, 8 feet in diameter, the piston 12 inches, band wheel shaft 8 feet long, band wheel 9 feet in diameter. What change can be made to lighten the draught? As it is it takes five horses to run a 40 saw gin. I want to decrease the draught to 2 or 3 horses. A. With the best arrangement you cannot drive a 40-saw gin properly with less than 4 horses. By putting your machinery in line and in good order, you may decrease the friction, so that 4 horses will drive the gin with the present machinery.

(11) W. M. asks: Which is the best for the health of the human kind, beef steak so rare that the blood will follow the knife, or steak cooked through only? A. The cooked meat is best.

(12) A. E. P. asks for a receipt for stain to apply to holly wood to imitate black walnut. A. Paint over the wood with a solution made by boiling 1 part of catechu, cutch, or gambier, with 30 parts of water and a little soda. This is allowed to dry in the air, and then the wood is painted over with another solution made of 1 part of bichromate of potash and 30 parts of water. By a little difference in the mode of treatment, and by varying the strength of the solutions, various shades of color may be given with these materials, which will be permanent, and tend to preserve the wood. After drying, slightly oil and finish with shellac varnish if desired.

(13) C. L. T. asks how to put on the watered or mottled appearance to brass articles. A. The brass is first polished to the required degree, and if it is a fine surface, the mottled appearance is imparted by rubbing over it with a gyratory motion a Scotch gray stone moistened with water. If the work is not very fine, a piece of fine emery paper may be used in the same way. If it is coarse, a dead smooth file may be used. Another method is to secure emery cloth or paper to the end of a small round stick, placing the stick in the universal chuck of a lathe, holding the work against it with a light pressure, and moving it along while the lathe revolves.

(14) R. H. G. asks how to stain light colored wood a dark mahogany, cherry, or rosewood color, something that will not have to be applied hot. A. 1. Boil ½ lb. logwood in 3 pints of water, and add ½ oz. salt of tartar. 2. Boil ½ lb. madder and ¼ lb. fustic in 1 gallon water. 3. Boil 1 lb. Brazil wood and 1 oz. of washing soda in 1 gallon of water, apply, and then brush over it before dry a solution of 2 oz. alum in 1 quart of water. With these wood, if dry, may be stained in the cold; but the dyeing will be accomplished far more quickly and satisfactorily if the liquids are applied hot.

(15) J. W. writes: In placing a heater of a series of pipe in flue from boiler to stack, I circulate the feed water through and heat the water to say 50, 100, 150, 200, or 250° by thermometer, what saving per cent of coal should I have when thermometer indicates at the different figures, or does the saving vary at the different figures? A. In the use of heaters for the feed water of steam boilers the gain can be estimated by the following formula: $E = \frac{t' - t}{T - t}$, in which E is the economy or gain per cent, T total temperature (sum of latent and sensible heat) t—the temperature of feed water entering the heater, t' the temperature of water entering the boiler after passing through heater. Example: T = 1,200°, t = 50°, t' = 200°; then $E = \frac{200° - 50°}{1000°} = 0{\cdot}15$, or 15 per cent gain.

(16) O. F. R. writes: I have 24 inches (miner's, 1 in. hole, 10 inches pressure of water). I have a 5 stamp mill, stamps weighing 480 lb. each, each stamp must drop 80 to the minute. What size overshot wheel and what size drums will it require to run the mill of 5 stamps, 80 drops to the minute, with 24 inches of water? A. To work the stamps would probably require 15 horse power = 495,000 foot lb. Allowing that an overshot wheel will give 66 per cent of the power of the fall, you would require a wheel about 30 feet diameter.

(17) J. A. H. asks: 1. Will three plain cylinder boilers, each 30 feet by 36 inches, with grate surface 6 by 9 feet, afford sufficient steam for two 11x18 engines? A. Yes. 3. Will a 50 horse engine doing 30 horse work require more steam than a 30 horse engine worked to its full capacity? A. Very little, scarcely appreciable. No more if the 50 horse is worked expansively to the best advantage.

(18) W. E. S. writes: I am about to construct a small steam skiff about 12 feet long by 3 in width; please inform me what size cylinders it will require to run it, provided I have one engine on each side of the wheel. A. Two engines, 2½ inches cylinder and 3 inches stroke.

(19) S. H. H. asks: 1. Which way will two engines, coupled together on the same crank or fly wheel shaft, give the most power, with the cranks quartered like a locomotive so there is no dead point, or set exactly opposite each other? A. There would be no difference in power, but set at right angles, will work steadier and better for all purposes.

(20) E. T. asks how to detect alum in bread. A. M. Buchner, a French scientist, discovered that a single drop of alcoholic extract of Campeachy wood, placed upon pure flour or bread, will cause a brownish yellow stain. If the flour contains alum, in the proportion of one or two per cent, the color will turn to a grayish blue or violet gray. With one half per cent of alum the lint is reddish yellow, with a border of gray blue, and small blue spots can be discovered by examining it with the lens. One fourth per cent of alum is the limit of reaction, when the blue border disappears, although the small spots are faintly discernible.

(21) J. A. G. asks: 1. How can I stop leaks in steam pipes? A. It depends entirely upon the metal of the pipes and character of the leak. If the pipes are defective they should be replaced. If the leak is due to poor fitting the only proper remedy is to do the work over. If the leak is due to unequal expansion the pipes must be re-arranged. 2. How many cells would be required to make a good magnet of a steel bar weighing about 1 lb.? A. About 4 cells of Bunsen battery. 3. Where can I find instructions for making a small magneto electric machine? A. In SUPPLEMENT, No. 161.

(22) G. S. L. asks what size boiler is needed for running small engine, 2 inch stroke by 1 inch bore? Also, can I heat the same by oil: if so, what kind of oil would be best for the purpose? A. Your boiler should have about 10 square feet of heating surface. You can run such a boiler with kerosene, but gas is much better.

(23) C. W. N. asks: How many pounds strain will the cogs on two wheels support, one wheel being 12 inches the other 7 inches in diameter (the strain being steady); size of cogs: length 1⅞, width at base ⅞, width at top ⅜, depth ⅝; two cogs in mesh at a time? A. If the teeth bear fairly, one tooth 450 lb., two, 900 lb.; in actual use, not more than one-fourth these pressures should be allowed. 2. How much will a ⅝ wire cable chain support on a steady strain—how many pounds? A. For a short link chain made of ⅝ inch wire, 6,700 lb.; and for wire rope ⅝ inch diameter, 4,000 lb. These are maximum working strains.

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(24) W. S. J. writes: We have a tubular boiler, upright, 32 2-inch flues. The boiler is made of five-sixteenths iron, 24 inches diameter; length of flues 36 inches. What would be the safe working pressure for such a boiler? Is this size boiler large enough for a 4 horse power engine? A. If all other parts are equal to the strength of the cylindrical shell, 150 lb. The government rule would allow more. It is equal to 4 horse power with good fuel and a sharp draught.

(25) W. E. H. asks: 1. Is it practicable for me to convey power for my elevator (say 4 horse power) from a mill 500 feet distant by a wire rope? A. Yes, by dividing the distance aud putting up an intermediate carrier shaft and pulley. 2. What size wheels and rope do I want? I know wire ropes are run in this vicinity for like purposes for short distances. A. A rope three-eighths or seven-sixteenths in diameter, on 4 foot pulleys, making 120 to 140 revolutions per minute, will be ample.

(26) B. and B. write: The suction pipe of a steam pump being 2½ inches inside diameter, the ends plugged up, how many holes of ¼ inch in diameter should be put in the pipe (to serve as a strainer) to perfectly supply it with water? A. One hundred.

(27) L. P. L. writes: The mercury in my thermometer has separated. How can I remedy it? A. By gently jarring the separated portion down.

(28) J. G. R. writes: 1. I wish to make the small French battery used by physicians, called the French pocket battery. It uses some salt of mercury in the battery. A. You will find this battery described in SUPPLEMENT, No. 159. 2. How many layers, and what is the number of wire in the primary coil? Also, what is the number of wire in secondary, and how many layers? A. Primary, No. 20, 4 layers; secondary, No. 40, 10 or 12 layers. 3. What is the size of core and number of the iron wire? A. Core, ⅜ inch, composed of No. 20 iron wires. 4. How long, and how big round is the spool? A. 3½ inches long, 1 inch to 1⅛ inches in diameter. 5. What is the salt used in the battery? A. It is proto-sulphate of mercury. 6. Of what does the negative pole consist? A. Zinc. 7. How heavy ought the armature iron to be? A. One or two pennyweights. 8. What are the proportions of peroxide of manganese and carbon in the porous cell of the Leclauche battery? A. About equal parts.

(29) M. N. asks: Suppose a thin band cylindrical or slightly conical, about the screw of a ship. Would not some of the force, wasted in moving the water in a direction perpendicular to the axis of the screw, be made useful in propelling the ship? A. Such bands have been tried repeatedly, but without advantageous results.

(30) A. W. J. asks how long a first-class air pump should hold its vacuum—air pump with single brass barrel? A. If pump valves, joints, and pipes be practically tight, for many hours.

(31) W. W. & S. ask how much difference is there between one ton hard coal and one tou soft coal in heating power? A. The evaporative power of good anthracite coal is rather higher than that of bituminous with suitably proportioned boilers. 2. Does it injure a boiler more firing with hard coal than soft? A. No, if the coal be free from sulphur.

(32) W. P. writes: I have a yacht 24 feet long, 6 feet beam, 3 feet deep; which I am going to run with a 6 horse power engine and 8 horse power boiler; intend it for pleasure and light towing in slack water. Am not so particular about speed as power. Will you please inform me in your valuable paper what sized propeller I need for this engine? A. Judging from the information given, we would say about 30 inches diameter and 3 feet pitch.

(33) J. L. asks: 1. Can the steam from an 8x24 be condensed in a cistern 8 feet wide and 16 feet deep? A. Yes, but you must have means of changing the water, as it would gradually get hot and become incapable of condensing the steam. 2. Would the water from the condensed steam be fit to be used again for the boiler? A. Yes. 3. How could I make an electric battery so as to run it with vinegar? A. A zinc and copper plate plunged into vinegar will generate an electric current, but it does not make a desirable battery.

(34) E. D. asks for a recipe for a black ink for use on the "copygram." Colored inks are prohibited in the army, and I know no place where labor can be saved to better advantage with a "copygram" than in the army, with its duplicates, triplicates, etc. I can take ordinary copying ink and get two or three impressions, but not entirely satisfactory ones. A. Try a strong aqueous solution of nigrosin, soluble aniline black.

(35) J. M. asks where the stone is found from which plaster of Paris is made. A. Gypsum is found in New York, Michigan, Virginia, Ohio, Canada West, Nova Scotia. The most important beds are those of the Paris basin at Montmartre.

(36) F. M. O. asks what materials, and the proper proportions of the same, are required to make what is now considered to be the best copying pad, with directions for mixing them. There have been so many receipts printed, that it is difficult to tell which is the best. I want to make one pad 10x12 inches. A. See page 325, Vol. 41, SCIENTIFIC AMERICAN.

(37) L. S. W. asks what the dimensions and the size and number of tubes of a boiler for a 5 horse power engine are, and have it plenty large enough; also, what would be the cost of such an one. A. Thirty inches diameter and 6½ feet high. 40 or 42 tubes, 2 inches diameter and 48 or 50 inches long, cost about $290.

(38) F. S., referring to the electric machine described in SUPPLEMENT, No. 161, asks: 1. Would the power of the machine be increased any if made larger, say ½ or twice as large as the drawings given? A. Yes. 2. Is it necessary to have the bearings at each end of the armature secured to the sides of the magnet, and if not, will they have to be insulated from the base? A. The bearings of the armature may be secured to the base of the machine. They need not be insulated. 3. Will it do for the two arms of the magnet to be joined at the bottom? A. They may be joined by some non-magnetic material such as brass, rubber, wood, vulcanized fiber; but they should not be united or joined by iron or steel as the magnetic current would then be through the ends of the magnet and the connecting piece, instead of through the armature. 4. Would it do to have the commutator made of hard wood covered with rubber or gutta percha? A. Hard wood without the covering of rubber will answer very well.

(39) M. T. J. asks for the best method of magnetizing large size horseshoe magnets? If large quantity battery and electro-magnet is used please give proper proportions. A. The simplest method of magnetizing horseshoe magnets is to draw them from the bend to the poles across the face of an electro-magnet, breaking the current as the poles of the steel magnet come opposite the poles of the electro-magnet. This operation is repeated until the steel is fully charged. The electro-magnet for this purpose should be about 6 inches long, with soft iron cores 1 inch in diameter wound with eight layers of No. 16 cotton covered copper wire. The battery should be 4 to 6 cells of Bunsen, which may be connected either for tension or quantity.

(40) E S. F. writes: 1. I am making one of the telephones described in No. 142 of SUPPLEMENT. I should like to know what kind of wire I must use. Will No. 24 copper wire do? If not, what size shall I take? A. The size of wire is given in the article referred to. It should be No. 36 or No. 38 silk covered copper wire. No. 24 will not answer. If you make the telephone shown in Fig. 2, in SUPPLEMENT 142, you should make the spool as thin as possible, and the clamp which binds the magnets together should be of brass, rubber, wood, or some other non-magnetic material. 2. I am making in connection with this an electric call-bell, and I should like to know also if one bell of a common gravity battery will do? The distance between the telephones will be about 550 feet. A. See telephone calls, in SUPPLEMENT 162. One cell of gravity battery will do, if everything connected with the line is adapted to it; but it is preferable to use 2 or 3.

(41) C. E. asks (1) how to make a cheap magic lantern. Have a lens 2½ inches diameter and about 7 inches focal distance. A. You cannot make a very satisfactory instrument with a single lens, although you may use it for projecting very transparent slides on a small screen by arranging a box for containing the lamp and receiving the slides and making an adjustable tube for holding the lens from 5 to 8 inches from the slide. 2. How to silver glass for mirrors, say two or three inches square? A. For methods of silvering glass, see SUPPLEMENT 105.

(42) A. E. R. asks (1) how to make an Edison transmitter? A. See SUPPLEMENT 163, for a full description of Edison's transmitter. 2. I have made an Edison transmitter, but it does not work to perfection, it seems to be loud enough but it "buzzes." Can you tell me the cause? I use a carbon taken from a common carbon battery. Is there anything better? A. Use lampblack collected from the chimney of a petroleum lamp. 3. I have read that the primary wire of the induction coil should be on the outside, but I have mine on the inside: which is correct? A. Either will do. 4. Is there a spring used in a transmitter, and if so, for what purpose? A. There is no spring in Edison's transmitter.

(43) F. H. B. writes: I am thinking of putting up a telephone with another room. Will you please describe the most easily made receiver and a transmitter that will transmit, perfectly and distinctly, words spoken in a moderately low tone? I would like to have the transmitter made to appear from without, somewhat like the one that looks like a small box, with the diaphragm in the center of the door. The greatest distance that the telephones will have to work is about 150 to 200 feet. Please also tell me if, for this distance, there is an instrument that will take the place of both receiver and transmitter, and will transmit speech nearly as well? A. The Blake transmitter described on p. 274, Vol. 41, SCIENTIFIC AMERICAN, would answer your purpose. One of the telephones described in SUPPLEMENT 142 will answer as a receiver. It is probable that some of the best forms of magneto-telephones would answer both as transmitter and receiver, but you will get better results by using a transmitter and a battery.

(44) D. P. D. asks: What is the difference between the velocipede and tricycle? The derivation of the latter and bicycle tells me the one has three wheels, the other two. But what the velocipede is in contradistinction to the other two is unknown to me. A. The word velocipede means swift foot, and applies properly to two, three, and four-wheeled vehicles propelled by foot.

(45) W. H. S. asks: 1. Does the copper wire wound on a horseshoe magnet require to be insulated? A. Yes. 2. What batteries will be required and what sized magnet to lift twenty pounds? A. Use two cells of Bunsen battery. Make the magnet four inches long with half inch cores, and wind with eight layers of No. 18 cotton or silk covered wire.

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FOR WHICH

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March 30, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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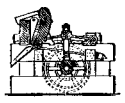

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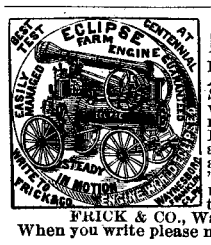

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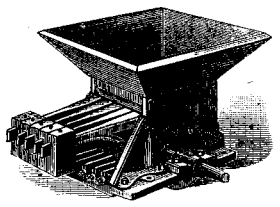

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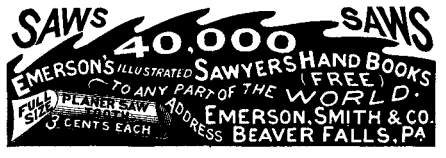

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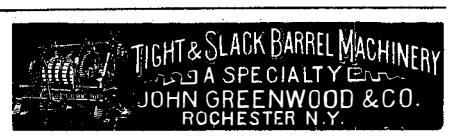

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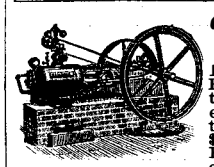

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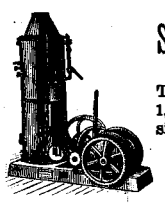

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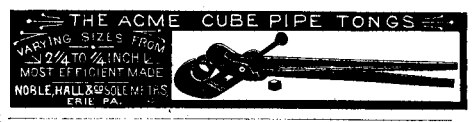

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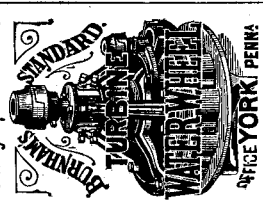

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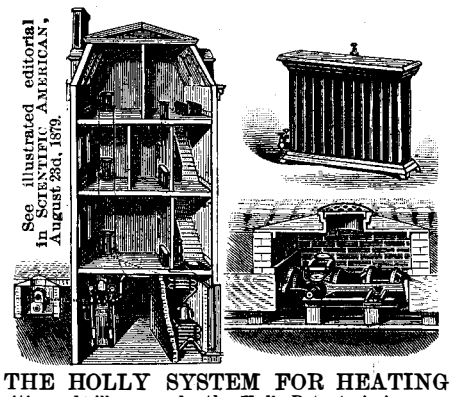

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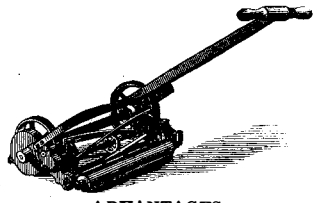

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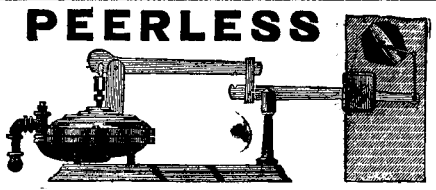

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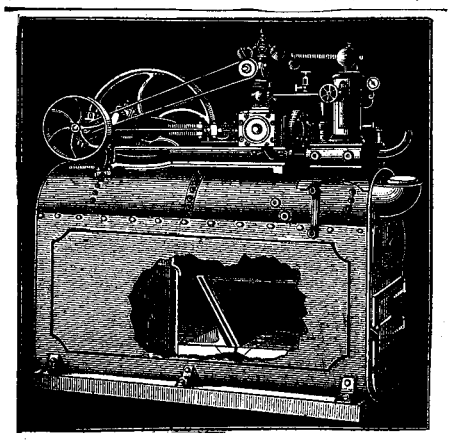

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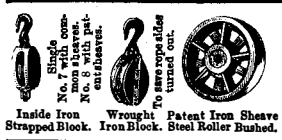

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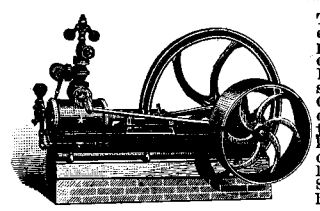

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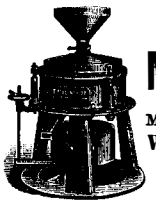

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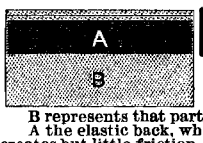

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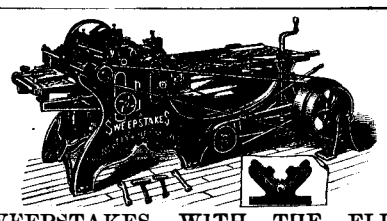

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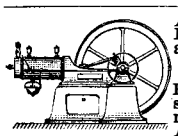

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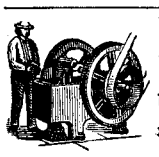

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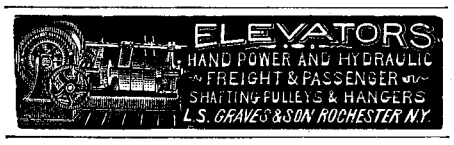

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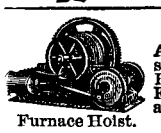

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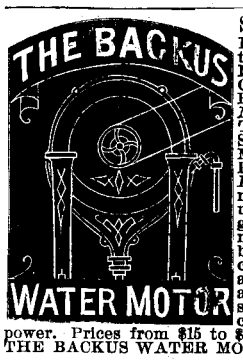

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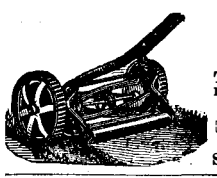

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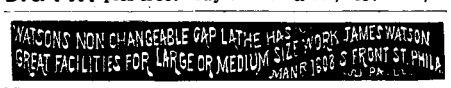
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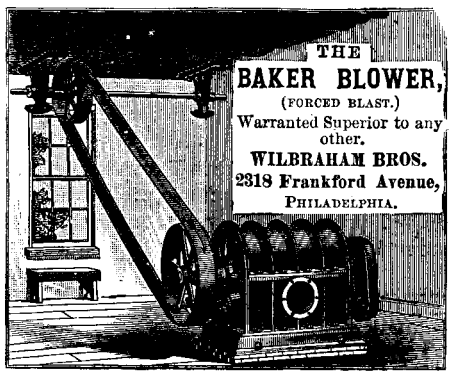

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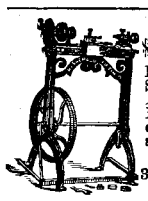

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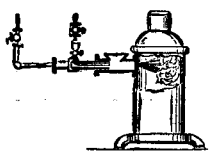

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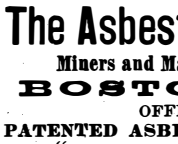

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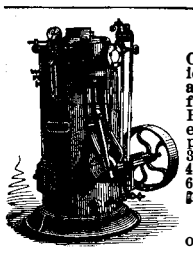

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